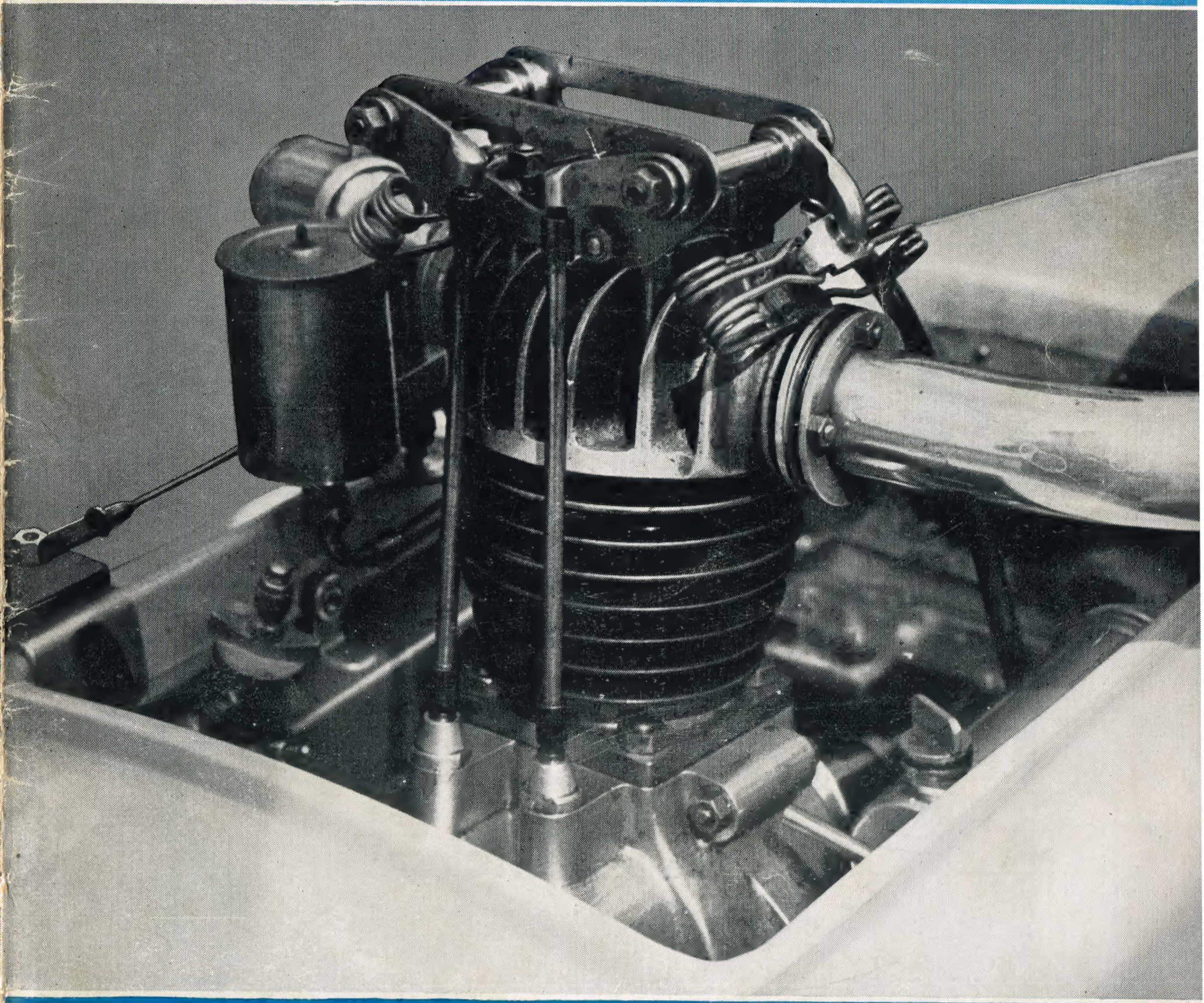
THE MODEL ENGINEER

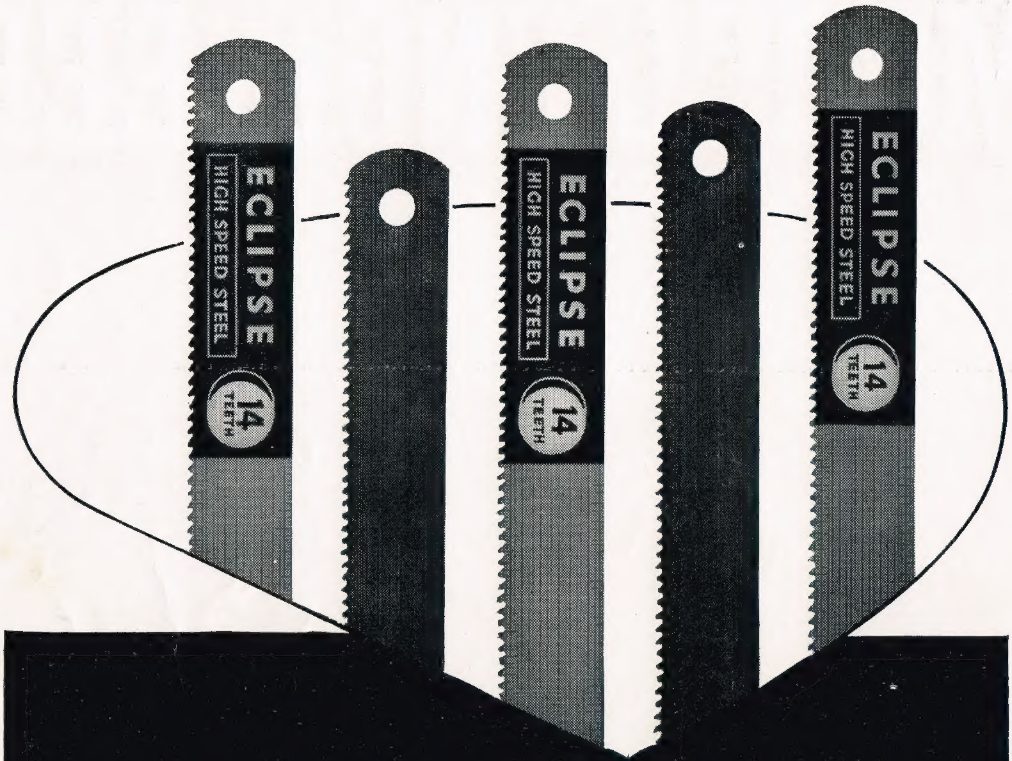


IN THIS ISSUE

- 1953 "M.E." SPEED-BOAT COMPETITION ● MAKING NUTS
- L.B.S.C.'s LOBBY CHAT ● THE TALE OF A 3-STEP PULLEY
- ● BRITISH CRAMPTON LOCOMOTIVES ● READERS' LETTERS
- A MODEL JEEP ● QUERIES AND REPLIES ● A "TWIN SISTER"

FEBRUARY 11th, 1954
Vol. 110 No. 2751

9D


ECLIPSE
HIGH SPEED STEEL
14 TEETH

You can afford a "MYFORD" from A. J. REEVES of course!

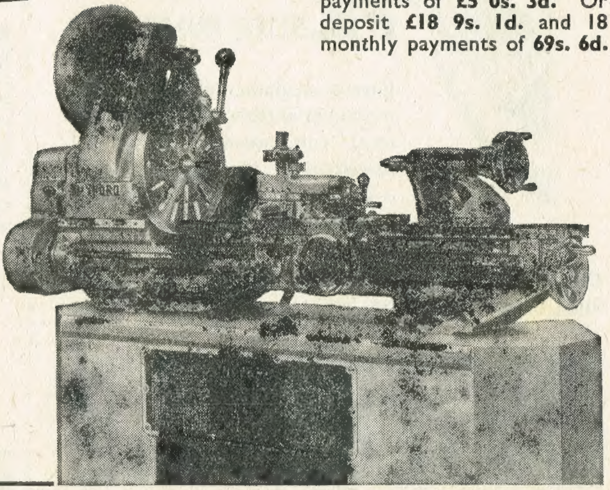
Streamlined service—immediate delivery from stock. Myford M.L.7 lathes and accessories are available on our well-known OUT OF INCOME TERMS—NO FUSS—NO BOTHER—a sound common-sense method of planned expenditure.

MYFORD M.L.7

Bench lathe with standard equipment **£48 5s. 0d.** Deposit **£12 2s. 0d.** and 12 monthly payments of **68s. 7d.** Or deposit **£12 2s. 6d.** and 18 monthly payments of **47s. 11d.**

MYFORD M.L.7

Lathe on steel cabinet stand, motorised, single phase, **£73 11s. 2d.** Deposit **£18 8s. 2d.** and 12 monthly payments of **£5 0s. 3d.** Or deposit **£18 9s. 1d.** and 18 monthly payments of **69s. 6d.**



WE PAY CARRIAGE OUT

(Mainland only). Illustrated MYFORD literature gladly sent together with detailed quotation, quite free of obligation.

A 1/- stamp or P.O. will bring you a copy of our comprehensive illustrated catalogue with details of blueprints, castings, materials and fittings for many "L.B.S.C." designed small steam locomotives; workshop equipment, etc.

A. J. REEVES & CO.

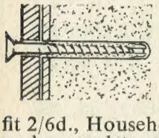
416 MOSELEY ROAD, BIRMINGHAM 12

Grams: REEVESCO, BIRMINGHAM Phone: CALTHORPE 2554

"The choice of experience"

RAWLPLUGS

—for speedy screw-fixing



For simple and speedy fixing of equipment, racks, motors, etc. to brick, stone or concrete—*use Rawlplugs!* There's a Rawlplug for every size of screw, and Rawlplug easy-to-use Tools for speedy hole boring. Popular Outfit 2/6d., Household Outfit 6/-, Handyman Outfit 9/6d., each complete with Rawlplugs, Screws, Hooks and 16-page booklet "Hints on Fixing".

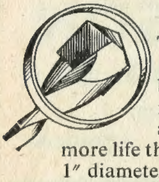
RAWLPLUG

DURIUM

Registered Trade Mark

TIPPED DRILLS

—for fastest-ever masonry drilling

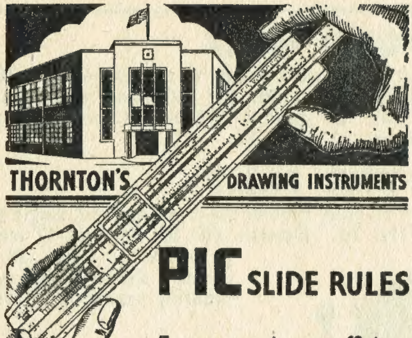


There's nothing to equal the astonishing speed of these drills in penetrating brick, stone, tiles, etc. The Durium new process carbide tip is harder than any metal or alloy, giving fifty times more life than ordinary drills. In sizes from 5/32″ to 1″ diameter—can be used in hand or electric drills.

TRADE ENQUIRIES INVITED

B472

THE RAWLPLUG COMPANY LIMITED, LONDON, S.W.7



PIC SLIDE RULES

Ensure maximum efficiency with minimum of scale length over the most comprehensive range of calculations. No other slide rule —British or foreign—offers the same or equal advantages.

Our illustrated Catalogue giving particulars of P.I.C. Slide Rules, Drawing Instruments, etc., is sent post free on request.

A. G. THORNTON LTD
Drawing Instrument Specialists
WYTHENSHAWE, MANCHESTER
Tel: WYThenshawe 2277 (4 lines)

First of all, our Illustrated Blueprint-Casting and Fittings Catalogue ; for 1/- in stamps ; refunded on first 20/- order.

And we are proud to offer the following for all folk who want something just that little bit better than the average quality offered today.

Precision made Hex steel screws 2-3-4-5-6-7-8-9-10-12 B.A. x $\frac{1}{2}''$ long ; all one price ; special offer ; Post free ; 11s. 9d. per gross. Nuts to suit 6s. 3d. per gross.

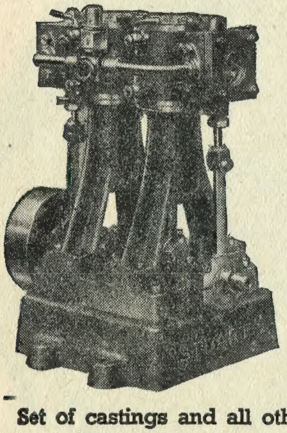
May we braze that boiler for you ?
Boilers made-designed-tested-overhauled or completed for you by the country's leading expert ; try us ; we have not yet failed to make good on any boiler that we have attempted, and we have had some rough un's to handle. Mechanical Lubricators, to L.B.S.C. design. 1″ square, $1\frac{1}{4}''$ square, 1″ x $1\frac{1}{4}$.″ All 32s. 6d. each. 2″ square, double ram. 52s. 6d. each. How about a nice neat L.B.S.C. Injector, the smallest commercial injector made, only 30/- each, complete with fitted check valve.

2 ounce Spark Coils, to Mr. E. Westbury's design, only a few more left at 8s. 6d. each.

★ Export orders a speciality.
Catalogues free to Overseas buyers.

KENNION BROS. (HERTFORD) LTD.
2 RAILWAY PLACE
Phone 2573 — **HERTFORD, HERTS.**
Weekdays, 8.30 to 6. — *Saturdays, 8.30 to 5*

STUART



THE DOUBLE 10 ENGINE

Set of castings and all other materials, screws, etc., with working drawing and instructions, £2 0s. 0d. Purchase Tax 6s. 8d.

Other engines, fittings and model supplies are in our catalogue — — — 6d. post free.

STUART TURNER LTD
HENLEY-ON-THAMES, OXON.

WE CORDIALLY INVITE

model engineers to call in at our showrooms and inspect the extensive range of tools and instruments on view there. We can supply everything from a lathe to the smallest pair of pincers. A visit would be worth while !

E. GRAY & SON
12-14 CLERKENWELL RD., E.C.1
'Phone : CLErkenwell 1174/5
'Grams : MATERIALS, SMITH, LONDON

THE MODEL ENGINEER

EVERY THURSDAY

Volume 110 - No. 2751

FEBRUARY 11th - 1954

ESTABLISHED 1898

PERCIVAL MARSHALL & CO. LTD. 19-20 NOEL STREET · LONDON · W·1·

CONTENTS

Our Cover Picture

We illustrate here a very fine example of a 30 c.c. o.h.v. racing petrol engine, as fitted to the " A " class hydroplane by Mr. W. Brightwell, to which further reference is made in the report of the " M.E." Speed-Boat Competition, elsewhere in this issue. Apart from the very fine design and workmanship in this engine, it provides an interesting sidelight on the relative merits of four-stroke and two-stroke engines, for high performance in small capacities. In recent years, the latter type of engine has been developed to produce much more power, in relation to its size, than was hitherto thought possible, and in consequence has become predominant in popularity. But although only two of the boats entered in the above competition have four-stroke engines, their performance shows that this type of engine cannot be disregarded; especially as the particular engine illustrated is by no means a new one. It was, in fact, built well before the war, and had done a considerable amount of work before installation in the present hull.

SMOKE RINGS

" M.E. " Exhibition, 1954

PREPARATIONS FOR this year's " M.E. " Exhibition are already well in hand, and readers are asked to note that it will be held, as usual, at the New Horticultural Hall, Greycoat Street, London, S.W.1, and the dates will be August 18th to 28th inclusive, excepting the Sunday.

A Generous Offer

A READER who lives in Alnmouth, Northumberland, has sent us a little appeal, which also contains a generous offer; he writes:

" Retired, I find it difficult to keep my workshop busy and would gladly help any fellow-m.e. who lacks the machine tools, the time, or the necessary manipulative skill. I have my own jobs going, but like a variety, especially interesting machining problems. Of course, no payment would be expected or accepted; only postages and actual out-of-pockets. The workshop is well equipped; there are 5-in., 3½-in. and 70-mm. lathes, the last a precision Swiss toolmakers'—I spent my post-war credits on this ! !—measuring instruments, micrometers, etc. No bench work; hand-sawing and filing are for the younger generation and need no machine tools."

From what we know of this reader and his work, we can assure anyone interested in this generous offer that he is an absolutely first-class craftsman. Enquiries should be sent to the Editor, " M.E."

The South Wales Federation

MR. R. PAGE, hon. secretary of the recently-formed Cardiff and District Federation of Model Clubs, has informed us of the marked success that has been achieved in the past few months (see " Smoke Rings " of November 26th last). So rapid and extensive has this been that, of necessity, the title of the Federation has had to be altered to " The South Wales and Monmouthshire Federation of Model Clubs and Societies." The news behind it, however, is excellent, and we offer our warmest congratulations, as well as our sincerest good wishes for the continued success and expansion of the Federation. Recently, a successful exhibition was held, supported by clubs from Swansea, Port Talbot, Neath, Barry, Newport and Cardiff, to a total of 12, and some 317 models were exhibited; the show was visited by nearly 10,000 people, which, in itself, shows what federation will achieve.

What is hoped will be the first annual general meeting will be held at the Y.M.C.A., Cardiff, at 7 p.m. on Monday, March 1st. Any reader desiring further information should get in touch with Mr. R. S. Page, 11, Twyn-y-Fedwen Road, Gabalfa, Cardiff.

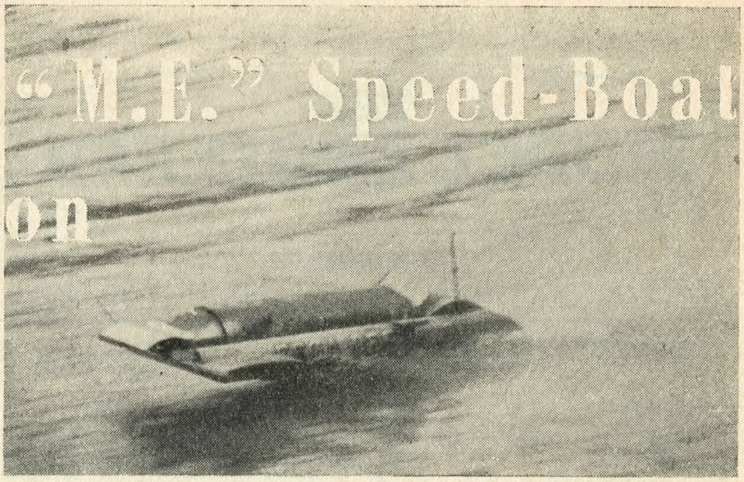
A 150-Years-Old Machine

IT SOMETIMES happens that ancient machines literally defy replacement by modern equipment. One instance of this was recently reported in the *Halifax Daily Courier and Guardian* and concerns a 150-years-old pulling stock which has just been repaired by James Garside & Son Ltd. of Copley. The stock, which is used to " beat " newly-woven cloth to close the weave, was originally driven by water power. The firm claims that the old-type machine, with its huge oak mallets, or " feet," is the only type that will produce the hard cloth needed.

What is especially interesting to us is the fact that Mr. Donald Garside, director of James Garside & Son Ltd., states that their stockwright, Mr. Maurice Marchant, who is rebuilding the stock, is getting a lot of help from an old model made by his grandfather; it is a working scale model and illustrates how the full-size one should work.

When the old stock is set to work again after its repair, it will be driven by an electric motor instead of by water power; otherwise, presumably, it will remain very much in its original condition.

The 1953 "M.E." Speed-Boat Competition



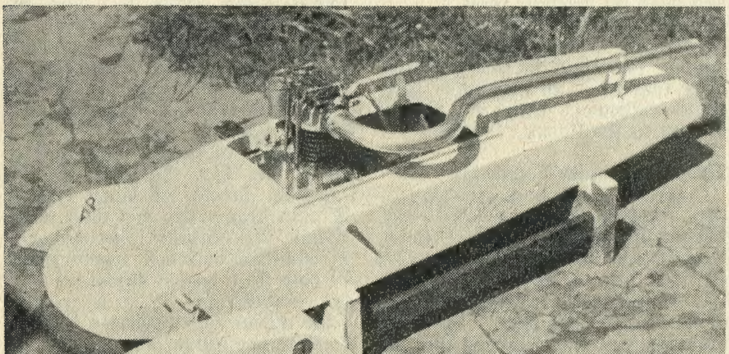
MODEL engineers, so we are often told, live in the past. This may be true (and not by any means to the discredit) of the many members of our fraternity who delight in the reproduction in miniature of past or present engineering prototypes; to follow these in design inevitably entails following them in time as well. But there are some branches of model engineering in which, so far from trailing behind full-size practice, the model actually leads the way, and the exponent of this type of model may, therefore, claim to be living in the future.

It is not our intention to draw comparisons between the merits of creative experiment and the no less solid virtues of prototype modelling; all contribute to the interest and variety which make model engineering worth while. But in the former category, no more brilliant record of effort and consistent progress has been shown than in the section devoted to the development of model speed boats. From the very earliest days of mechanical propulsion of ships, it has always been recognised that the attainment of high speed in or on water involves some of the most difficult and complicated problems, which persist and multiply as the standards of performance are raised.

Not all our readers are interested in model speed boats, and some may have an active dislike of them; but none can deny the ingenuity, perseverance and honest craftsmanship which is devoted to their development. It is often said that they are not models, because they do not conform to what are commonly regarded as orthodox forms of watercraft design. Apart, however, from the fact that no restrictions can logically be imposed on experimental design, it is significant that many of the principles which have been experimentally adopted, and found successful, in the design of model speed craft are now being applied equally successfully in full-size racing boats. Except for certain salient differences, caused inevitably by factors in engine design which cannot be scaled, and consequent effects on weight and lift distribution, the latter are tending more and more to follow the design of the models.

The entries in the 1953 "M.E." Speed Boat Competition are again fewer in number than we had hoped, and several well-known boats which have achieved distinction are not represented, but the entries do give a very fair cross-section of the types of boats which are most popular and successful. It will be seen that nearly half the total number of entries have attained a speed of around a mile a minute, and that this performance has been left well behind by the place winners in two classes. Most of the runs entered have taken place at public regattas.

A point which is brought into prominence not only in this competition, but also at regattas generally in recent years, is the continued popularity of the "A" class boats with 30 c.c. engines. This, it may be remembered, was the original "International" class, under the rules formulated in the early days of the M.P.B.A., in consultation with Continental clubs. At the time, not many successful racing engines of a smaller size had been constructed, but later experience in engine development led to the introduction of a "Miniature" class with 15 c.c. engines, now specified as "B" class. Since the war, however, the most popular engine in international contests has been the 10 c.c. size, largely due to the availability of highly efficient ready-made engines of this capacity (though these are not eligible for the "M.E." Annual Competitions). The result of this was an immediately noticeable recession in the popularity of the larger engines, and at one time it was



A pre-war engine in a post-war hull—Mr. W. Brightwell's "A" class boat

THE 1953 "M.E." SPEED-BOAT COMPETITION RESULTS

Name of Boat	Owner	Total Weight lb.	Engine Cyls.	Engine Type	Engine Bore	Engine Stroke	Hull Length in.	Hull Max. beam in.	Hull Planing surfaces	Propeller No.	Propeller Dia. in.	Propeller Pitch in.	Propeller Area each blade sq. in.	Propeller No. of blades	Speed m.p.h.
			"A" Class—I.C. Engines												
Orthon	J. H. Benson ..	8½	1	2-st.	1 7/16	1⅛	34	12	2	1	3¾	7½	1	2	72.62
W.14	W. J. Brightwell	12½	1	4-st.	32 mm.	37mm.	37	15	2	1	3⅞	8½	1.3	2	65.65
Rita	N. F. Hodges ..	11	1	2-st.	1.437	1.125	37	10⅝	2	1	3¼	9	1	2	65.56
			"A" Class—Steam Engines												
Eega Beeva	B. J. Pilliner ..	15 15/16	1	s.a.	1	1	44	10½	2	1	5⅛	10¼	1.22	2	53.83
			"B" Class—I.C. Engines												
Jab III	J. A. Bamford	5⅞	1	2-st	1⅛	⅞	35	12	2	1	3	5½	.625	2	51.14
Beta IV ..	R. E. Mitchell	7 9/16	1	4-st	1.07	1	29½	13¼	2	1	3¼	6	.9	2	50.5
Nipper 2 ..	M. de B. Daly		1	2-st.	1⅛	⅞	33	10½	2	1	3⅛	5	.90	2	48.47
			"C" Class—I.C. Engines												
Foz 2	R. A. Phillips	4 13/16	1	2-st.	1.0156	.750	28½	12	2	1	2 3/16	6	.420	2	69.1
Mephisto 4 ..	C. G. Stanworth	4 7/16	1	2-st.	1.008	.76	27½	9	2	1	2⅞	6.5	.566	2	51.65
Gamma II ..	R. E. Mitchell	4 5/16	1	2-st.	.98	.80	29½	11	2	1	2 5/16	5	.36	2	49.5
Gamma III ..	R. E. Mitchell	4 9/16	split-single	2-st.	.74	.70	30	11½	2	2	2¾	5	.5	2 per prop.	49.5

forecast that these, particularly the 30 c.c., would die out.

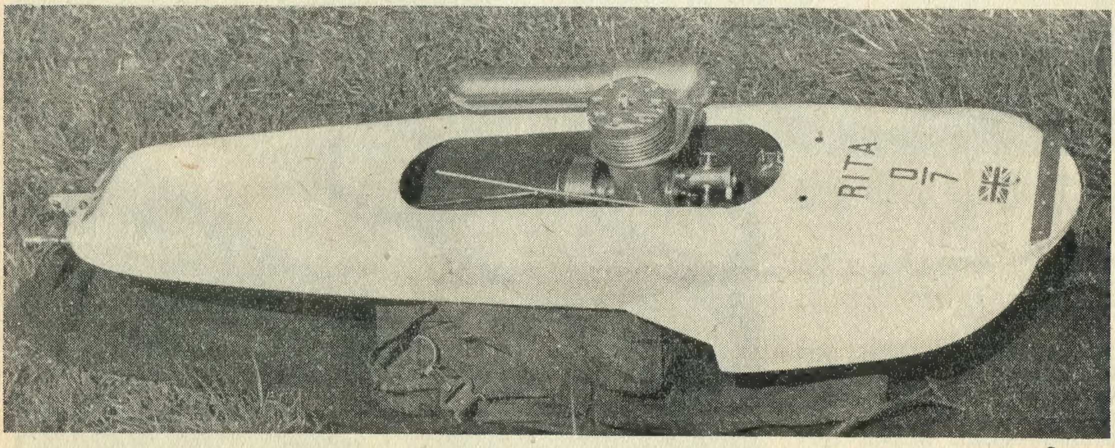
There are, however, several reasons why they are still preferred by many constructors, despite the fact that the smaller engines have been proved capable of producing extremely high speeds in suitable hulls. In the first place, the larger and more sturdy hulls have shown certain advantages in respect of stability under adverse weather conditions, while the larger engines are less exacting in construction and adjustment, resulting in more consistent performance. These generalisations, of course, do not apply in every case, but hold fairly true on the average.

At the present time, there is a definite recession in "B" class, which has not produced such high speeds during the last year or two as either "A" or "C" classes; it would be difficult to assign any definite reason for this, and it may be that the lapse is only a temporary one; this class certainly has its own particular advantages, being neither so unwieldy as "A" class nor so delicate as "C" class, while potentially capable of doing just as well as either.

It is rather regrettable that only one example of a steam-driven boat has been entered in this competition; can it be that steam enthusiasts are losing their dogged loyalty to this form of motive power, which has so often and so vehemently been proclaimed? Only one or two stalwart supporters of the fast flash steamer appear to be still with us, but their efforts at least provide sufficient proof that such boats still have definite possibilities, and are worthy of much wider popularity.

Hulls

There are no indications of drastic changes in the design of hydroplane hulls, but there is an increasing tendency to segregate the functions of the hull proper and the lifting surfaces or planes—not by any means a new idea, but its real popularity dates from the adoption of the surface propeller and the



A promising new "A" class boat, Mr. N. Hodges' "Rita"

two-point method of tethering. There is much to be said in favour of making the planes separate from the hull, as the shape of the latter can be simpler, and it is a relatively easy matter to make alterations and adjustments to the shape, area and angle of incidence of the planing surfaces. On the other hand, the completely integral hull can be made with greater strength and rigidity for a given weight, and is also capable of being made of more handsome shape and appearance, though this aspect of design is not always considered important.

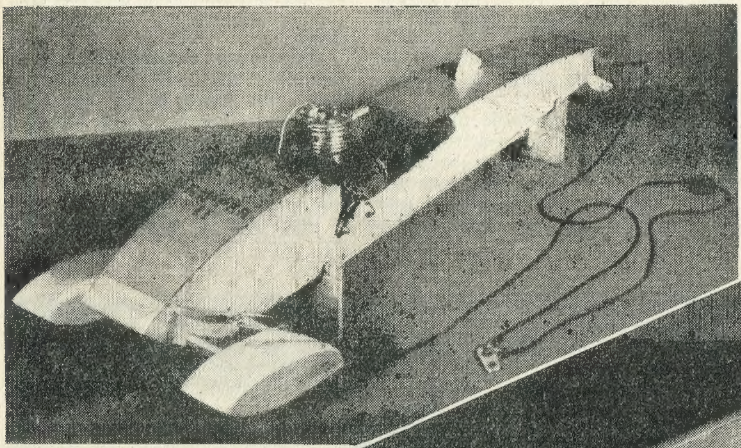
Some of the earlier attempts to use attached planes were rather unsatisfactory, owing to lack of rigidity of the planes themselves, or their means of attachment to the hull. Even at the present day, it is not unknown for the planes to be displaced, distorted, or torn away entirely; and some of the sudden and inexplicable mishaps to boats when running at full speed have been traced to temporary or permanent deflection of the planes.

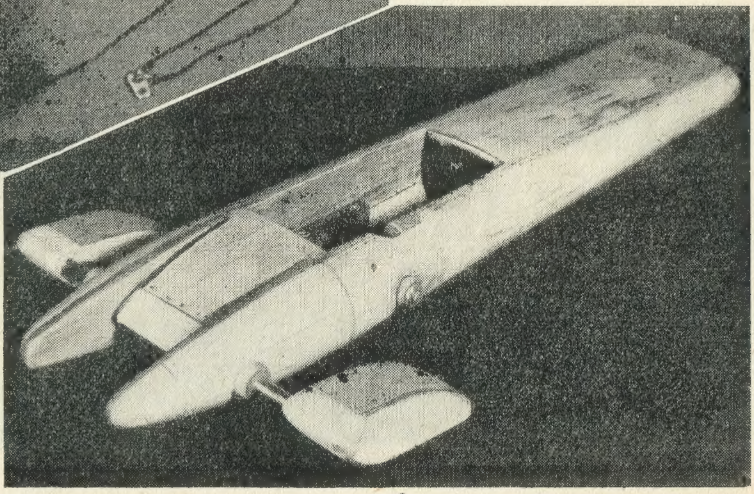
In the one example of a flash steamer entered in this competition, the very unusual, but by no means illogical, idea of controlling the angle of incidence of the planing surfaces has been experimentally adopted, following equally daring experiments in an earlier hull, in the use of an aerofoil to control the trim of the hull at high speed. Several constructors are giving a good deal of thought to the aerodynamical design of hulls, mainly with a view to reducing the air-lift effect on the front of the hull and the planing surfaces, which in the past has often caused "flipping" or back somersaults at a critical speed. This is the primary reason for the use of outrigger planes or "sponsons" spaced well away from the hull sides, thereby reducing the effect of air pressure under the hull. The cross-section of the hull is often designed to reduce air-lift, such as in the case of *JAB III*, which is of vee-section on the underside.

Hull construction methods do not show much change, though some original forms of structural design have been produced. The use of a skeleton frame, either of straight or steam-bent timbers, or fretted from laminated board, and covered with thin three-ply, has generally been found to give the most satisfactory results. Despite the need to keep hulls as light as possible, strength and durability are even more important, and few constructors favour the use of balsa, except for fairings or similar purposes which do not vitally influence the main structural strength.

In drawing up the new competition rules recently, some attempt was made to classify the types of hulls according to the arrangement of planing surfaces. Previously, it was the custom to classify hydroplanes according to the number of "steps" in the hull, but as it is now the exception rather than the rule to employ stepped hulls, the term has little meaning. Practically all model speed boats nowadays have developed what was once termed the "divided step" into two essentially separate planing surfaces, transversely arranged, and these, in conjunction with the propeller tip and possibly a small area of the stern floor, constitute the "three-point" planing contact. This generally holds good whether the planes are built into the hull, attached directly to it, or spaced away from it.

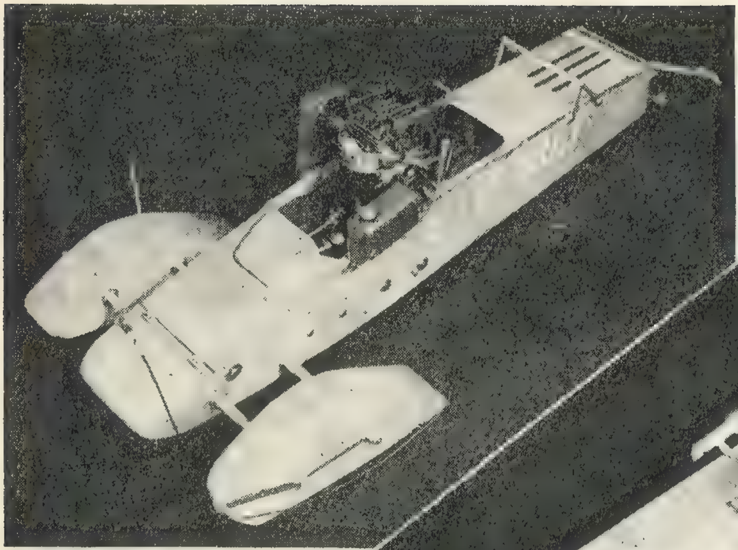
The common idea that speed boat hulls are roughly and unskilfully flung together, like the traditional "kipper box," is refuted by a close examination of some of the boats represented in these entries. For instance, in the case of *Foz* 2, which had been completely stripped for repainting when the photograph was taken, it was found that each of the sponsons was built up from no less than 19 pieces, and the compound curves at the "horns" of the hull were built up by planking, fitted and finished in a manner worthy of the most conscientious shipwright. All attachment points for struts and other fittings were reinforced by inset bushes or internal patches. It may be observed that this hull has survived at least two seasons of hard work, including several major mishaps, which it certainly would not have done had it been carelessly built.

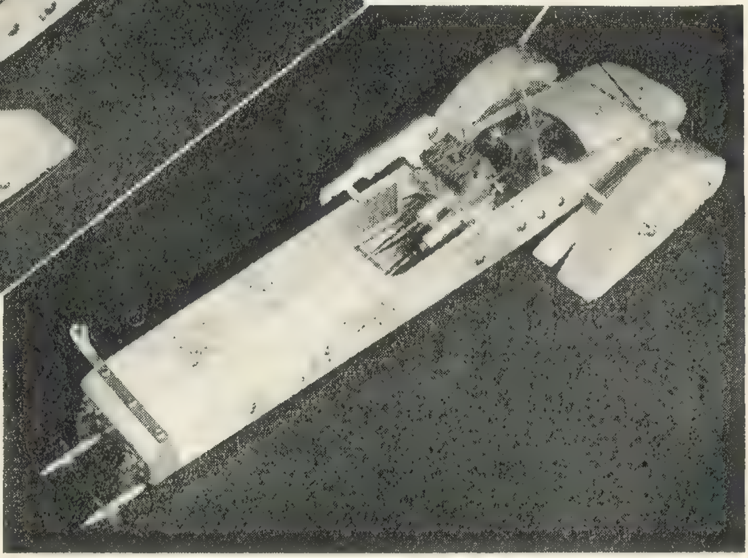




Above: The "B" class boat "Nipper II," by Mr. M. de B. Daly

Right: The stripped hull of Mr. R. Phillips' "C" class boat "Foz II"





Mr. Mitchell's "B" class boat "Beta IV" (above) has an o.h.v. four-stroke engine, but one of his "C" class boats, "Gamma III" (right) has a split-single two-stroke of unusual design, driving twin propellers

Engines

The two-stroke engine is still predominant, only two of the boats entered having four-stroke engines, namely Mr. Brightwell's *W*.14 ("A" class) and Mr. Mitchell's *Gamma IV* ("B" class)—and neither of these engines is by any means new. Indeed, in the former case, the engine was built well before the war, and would probably have won laurels early in its career, but for persistent hull trouble; its successful re-introduction in a modern type of hull, and the attainment of a highly creditable performance by present-day standards, is a proof that four-stroke engines cannot be written off as obsolete.

All the two-stroke engines, with one exception, conform to the specification with which most users of i.c. engines are familiar—short stroke, large port areas, rotary disc admission valve, running on alcohol base fuels, with glow plug ignition. Most of the improvements in engine performance have been obtained by detail alterations and adjustments —in other words, "tuning"—rather than by any salient developments in design. This, of course, conforms generally with racing practice in other spheres, where one often finds the apparent paradox of steady improvement in performance, though design appears to be at a standstill.

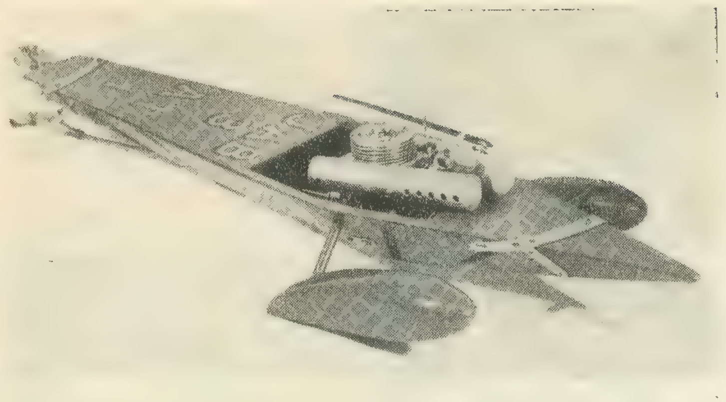
The one unusual type of two-stroke engine among those represented here is the "split-single" engine of Mr. Mitchell's *Gamma III*, which has already been fully described in THE MODEL ENGINEER. Although this engine has not produced any spectacular results, there is no doubt that it has fully justified the enterprise of its designer, being a very reliable and consistent performer, and the very fact that it produces even a moderately high speed, augurs well for the future possibilities for the development of this form of design, admittedly still in the embryo stage. This engine drives twin propellers, and this in itself is a daring experiment, as although it eliminates one disadvantage of the single propeller, namely, torque reaction, it introduces some totally new problems of its own. It will be noted that by a coincidence, the speed obtained with *Gamma III*, using this engine, is identical with that of *Gamma II*, which has a more orthodox type of two-stroke installed.

In the flash-steam power plant of Mr. Pilliner's *Eega Beeva*, the same principles are employed as in his previous boat *Frolic*, which has been described in a series of articles published during 1953. A photograph of this boat, running at full speed, will be seen in the heading to this article.

Propellers

All propellers of boats entered in this competition are of the partially-submerged or "surface" type, but so far as general design and construction are concerned, they do not differ from the older type intended to run completely submerged. These propellers have to be of extremely robust proportions, with blades of high tensile steel to stand up to the impact of hitting the water at very high speeds; not a few of the propellers used in the past have "folded their wings" like tired moths under the strain.

In the past, there has often been some confusion in the specification of the propeller, as the term "blade area" has been variously interpreted as applying to one or both blades, and projected either normal to the pitch angle, or to the axial cross-section. The blade area, as now specified, refers to the area of a single blade, measured on the pitch line; in other words, as the blade would appear as cut out "in the flat." It will be seen that while there is no *complete* agreement in pitch, diameter and area of propeller in any two boats, the specifications are fairly similar for boats of a given class, with the exception of the



Mr. J. Bamford's " B " class " Jab III " resembles a water-flea in appearance—and is just as lively !

one flash steamer. Even this, however, conforms fairly to type, as flash steamers have always been noted for their ability to turn huge propellers, the reason for which may be found in the torque characteristics of steam engines. Most forms of internal combustion engines, on the other hand, have a relatively poor torque at the lower speeds, and lack the ability to accelerate a large propeller up to the speed at which the engine develops its maximum power.

The two-bladed propeller still appears practically universal, and although many shapes of propeller blades continue to be tried out, no very definite ideas of their respective virtues appear to have emerged. It may be said that propeller design remains just as much a mystery as it ever was, and that no definite rules for ensuring propeller efficiency have been established. In most cases, having found by patient experiment the propeller best suited to a particular boat, it is treasured by the constructor like a rare jewel or a family heirloom.

Engine Speeds

It is always very difficult to obtain any information on the r.p.m. attained by engines of model speed boats when driving the hulls at full speed on the water, though this information would be very useful, in respect of both engine and propeller design. One boat in this competition, Mr. M. de. B. Daly's *Nipper II*, is equipped with a device to enable r.p.m. to be checked under running conditions. This consists of a metal " flag " (seen projecting through the after deck in the photo), which is alternately raised and lowered by a crank geared at a ratio of 500 to 1 from the engine shaft. The number of times the flag is raised and lowered in a given number of seconds (measured by stop watch) will thus give a clear indication of the r.p.m. Other experimenters have used somewhat similar " visual aids," including geared contact-makers to operate a flashing light, for the same purpose.

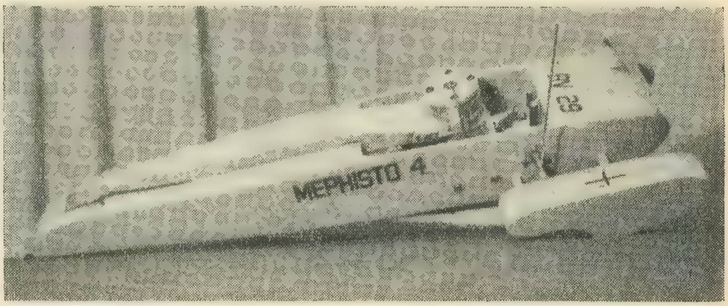
Personal Notes

Most of the entrants are well known in the model power boat world, and have figured in previous " M.E." competitions, one of the notable exceptions being Mr. W. Brightwell, of the Wicksteed club, though as already mentioned, he is certainly no newcomer to the sport. Another promising newcomer is Mr. J. A. Bamford, of the Aldershot club, who has carried out many enterprising experiments, not only with two-stroke and four-stroke engines, but also with flash steam, including the use of turbines and uniflow engines. Mr. N. Hodges, of the Orpington club, has put in a great deal of painstaking work during several seasons, with two or three different boats, and at last appears to be reaping the due reward of his labours ; he keeps his club flag flying this year in the absence of his illustrious colleague, George Lines, who has been unable to send in an entry on this occasion.

Mr. J. H. Benson is well known as the hon. secretary of the M.P.B.A. and has long been an exponent of steam-driven prototype boats, besides experimenting with flash steam hydroplanes; in company with Mr. M. de B. Daly, he represents the Blackheath club. Again the youngest of the contestants, Colin Stanworth is on this occasion the only representative of the Bournville club, which has many past successes to its credit. Mr. Mitchell continues to be the sole upholder of the Runcorn club, and with no less than three boats entered, is equivalent to a very active "team" himself.

The first and second place winners in each class will receive silver and bronze medals, respectively; all competitors have qualified for certificates of merit, having exceeded the minimum specified speed of 45 miles per hour.

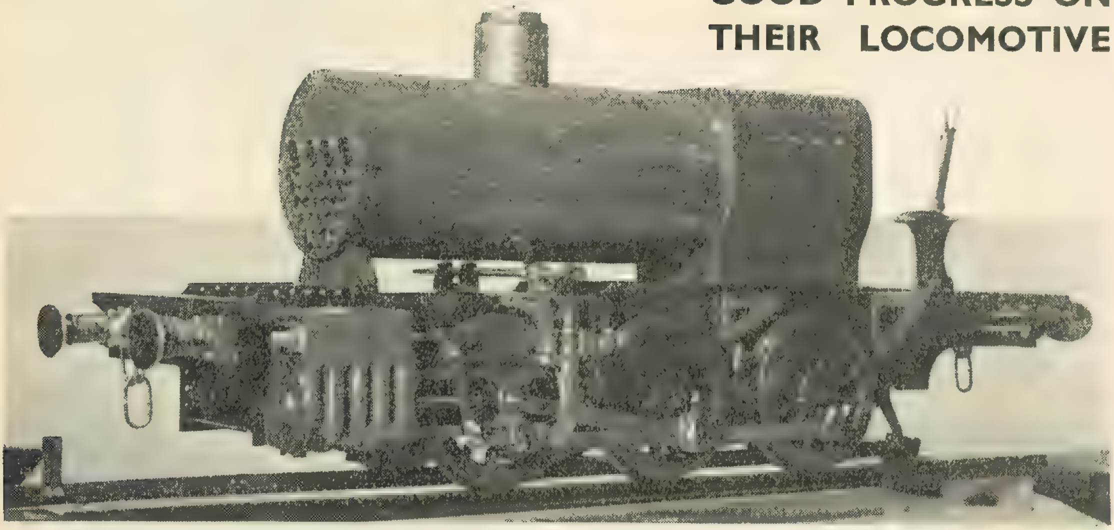
So passes another year of steady progress in the development of fast boats and high-efficiency engines, resulting in the establishment of new records and a further increase in the popularity of model power boats. While giving due credit to all whose enterprise and tireless endeavour have contributed to this progress, we may justly claim that the encouragement given to it by THE MODEL ENGINEER, in the inauguration and maintenance of annual competitions, has played a significant part in the movement. Many of the successful exponents of this and other competitive model sports have drawn their first inspiration from the pages of " ours," and have received guidance in their early endeavours from the practical designs and descriptions therein.



Mr. Colin Stanworth's " C " class boat " Mephisto 4 "

A "Twin Sister"

SCHOOLBOYS MAKE GOOD PROGRESS ON THEIR LOCOMOTIVE



The latest photograph, showing the chassis, complete, with boiler in position

IT is a little over three years since the Model Engineers' Society of Purley County Grammar School for Boys began work on their "Twin Sisters" locomotive.

In THE MODEL ENGINEER for April 3rd, 1952, we printed a photograph showing progress to date, which amounted to the main frames and wheels.

Some considerable headway has been made since that time, as can be seen from these latest pictures, and when one remembers that work is confined to dinner hours and any other spare time, one can appreciate the degree of interest and industry of the boys concerned.

Building a locomotive in the class of Austen-Walton's "Twin Sisters" is no mean feat.

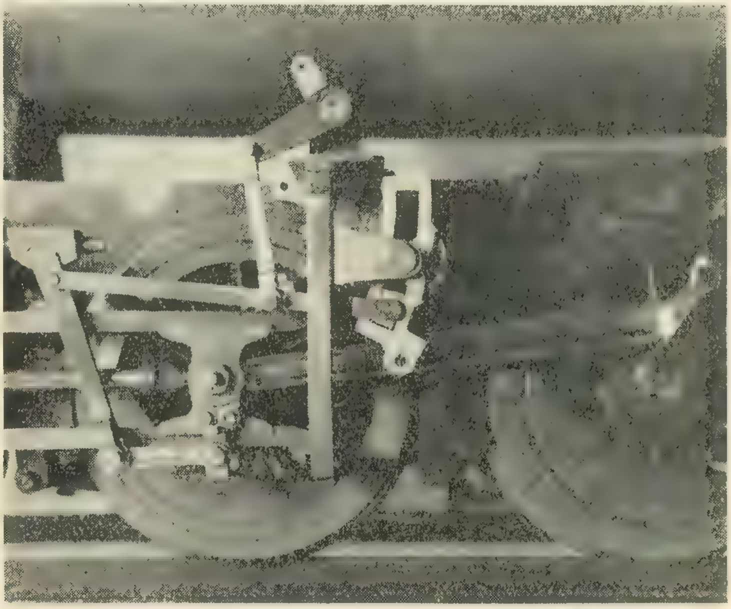
We understand that the locomotive is entirely pupils' work with the exception of a crosshead and parts of the motion plates. These were made by the handicrafts-master who asks, "How could I watch this locomotive coming into being without 'having a go'—that would be too much to ask?"—and we agree!

The whole job is taking longer than expected, but that is causing no concern, for it is an educational medium whilst in the making, and becomes a show-piece when completed.

It is not anticipated that the school will run a model railway.

The photographs are reproduced by courtesy of G. W. Watts.

We think that our readers will join us in very hearty congratulations to the boys and their handicrafts-master for what, to date, is a remarkably fine job. It is not very often that we have the pleasure of publicising boys' work of this calibre; it is refreshing to do so!



Close-up of valve-gear, showing the very good quality of workmanship

MAKING NUTS

By "Duplex"

GOOD quality, accurately machined, hexagon nuts are somewhat expensive to buy, particularly when a large number is required for the construction of a machine or a scale model.

However, nuts are quite easily made in the workshop from hexagonal material, and if some of the methods commonly used in repetition work are adopted, a batch of these parts can be machined in a very short time. Again, nuts of some non-standard size may be required; for example, a dozen 2-B.A. nuts of 4-B.A. nut-size were needed recently for securing the gib adjusting-screws of a machine under construction. These were made without difficulty in less than half an hour. Hexagon rod, both in brass and steel, is obtainable commercially in all the ordinary Whitworth, B.S.F., and B.A. sizes.

The rod is gripped in the self-centring chuck, and after the end has been faced, a centre-drill is fed in from the tailstock to afford a true start for the tapping-size drill that follows.

The latter drill is entered for a depth sufficient for making, say, half-a-dozen small nuts; do not drill too deeply in the first place, as there will be difficulty in tapping the nuts if the drill runs out of line towards the end of its travel. The rod can at this stage be tapped from the tailstock, but time will be saved, if as described later, the nut blanks are tapped in the drilling machine. Next, the end of the rod is chamfered with a tool of the shape illustrated in Fig. 1. The first nut is now parted off and, if the parting tool is formed with an oblique edge, as in Fig. 2, the nut will be cut off with a flat under side; the tool is then advanced further in order to face the end of the rod. Although a batch of nuts can be parted off to a uniform thickness by resetting the lathe saddle from the leadscrew index, an easier way, perhaps, is to use the tailstock barrel as a work stop. For this purpose, the tailstock barrel is screwed out to the full extent of its travel and the tailstock itself is then clamped in position on the lathe bed. After each nut has been parted off, the rod is reset in the chuck to make contact with a short length of rod gripped in the tailstock chuck.

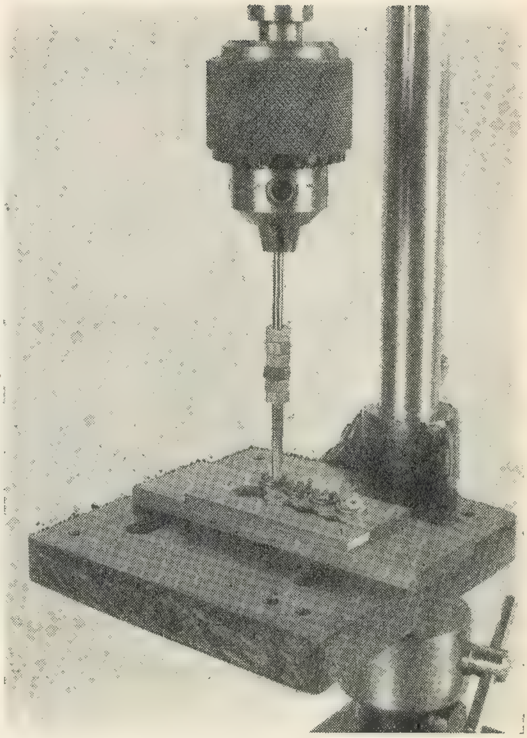


Fig. 4. Tapping nuts in the drilling machine

During the subsequent machining operations, the tailstock barrel is screwed back out of the way. The two tools illustrated are shown upside down because it is intended that they should be mounted in the two-tool back toolpost, so that they can, in turn, be quickly brought into position. With the arrangement described, the nuts can be automatically parted off to a uniform thickness by keeping the position of the saddle fixed.

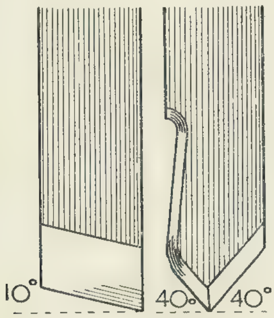


Fig. 1. A chamfering tool for use in the back toolpost

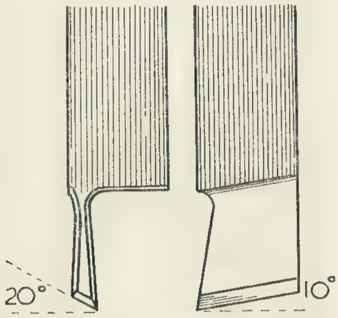


Fig. 2. A tool for parting-off nuts

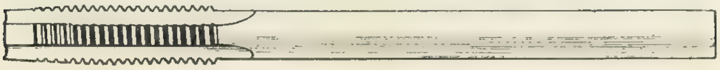


Fig. 3. A commercial machine tap

Machine-tapping the Nuts

When tapping nuts of medium size in the drilling machine, the machine should be run at slow speed or be turned by means of a handle attached to the upper end of the spindle; but small nuts can be readily tapped at a faster speed.

The lead on the ordinary tapered hand-tap is rather too steep for this work, unless special care is taken not to overload and break the tap. In this connection, a depth of thread engagement amounting to some 75 per cent. may be aimed at and the tapping-size hole is drilled accordingly.

This subject is fully dealt with in

the book on *Screw Threading and Screw Cutting* published by Percival Marshall & Co.

The machine tap, illustrated in Fig. 3, has a long lead and, therefore, enters the work with less resistance; in addition, the long shank is made slightly smaller in diameter than the tapping size of the thread. As shown in Fig. 4, this allows the nuts to accumulate on the shank, and the machine need not be stopped until the tap has become fully loaded with finished nuts.

When tapping nuts in the drilling machine, the individual nuts have to

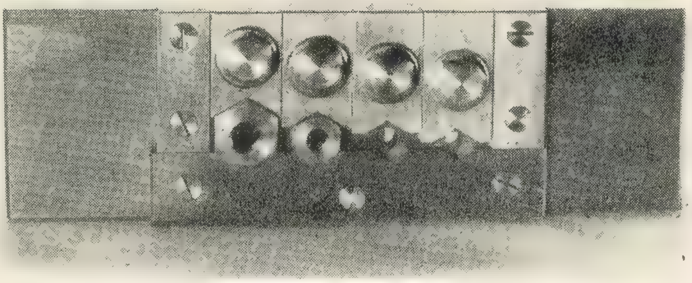


Fig. 5. An adjustable holder for four different sizes of nuts

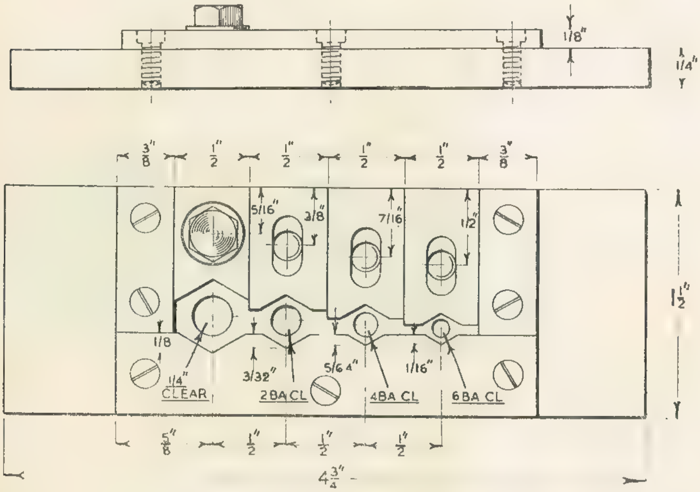


Fig. 6. Constructional details of the nut holder

lie flat and be prevented turning while the tap passes through and enters a hole or slot in the drilling table. For this work, the holder illustrated in Fig. 5 was made to take nuts ranging in size from $\frac{1}{4}$ in. B.S.F. to 6 B.A. The construction is quite straightforward and, as will be seen in the drawing, Fig. 6, the small, notched bars are able to slide so that they can be adjusted to hold any particular sample of hexagon rod. The notches, having an included angle of 120 deg., can be filed to shape after being marked-out with the parts assembled in position. But a much quicker and more accurate way is to mill the notches in the lathe with an end and face cutter, as shown in Fig. 7. A machine vice is bolted to an angle-plate secured to the lathe cross-slide, and the work is set at lathe centre height. The assembly is then set at an angle of 60 deg. to the lathe axis. After the four parallel faces have been machined to the full depth in the long bar, the work is turned end for end and the remaining sides of the notches are finished to depth. The small sliding bars are then machined in the same way. After the holder has been assembled, standard nuts are placed in position and tapping-size drills are used to spot the centres; from these centres the through holes are drilled out well above the clearing size of the tap.

Finishing the Nut Flats

To give the nuts a good appearance, the flats should be finished by filing, and it saves time if, as shown in Fig. 8, several nuts are mounted on a threaded spindle and the file is worked in an axial direction. In this way, the file is given some

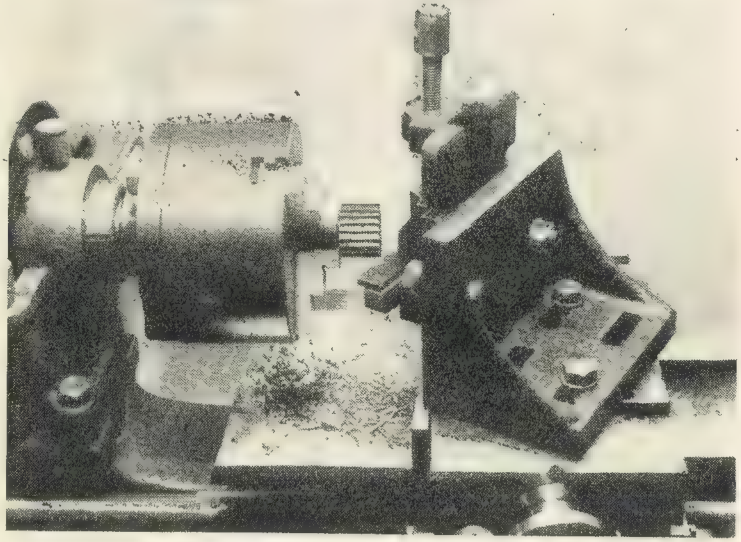


Fig. 7. Milling the notches in the nut holder parts

guidance and a more uniform finish is obtained.

Combination Nuts

A contributor to this journal described, in a recent article, the Penn type of nut fitted to a marine engine, each nut being, as he said, a piece of individual craftsmanship, consisting of a bronze nut in one with a filleted washer.

A similar type of nut was fitted throughout the 1907 Triumph motor-cycle and was retained in after years. A specimen from this machine is illustrated at the right of Fig. 9. The two other nuts were made in the workshop for fitting to machine tools, and they certainly add somewhat to the appearance of the machines.

For those who do not mind going to the trouble of making these special nuts, the sequence of machining operations is set out in Fig. 10. The operations shown in *A* present no difficulty, but for forming the groove illustrated in *B* a special, round-nosed tool is needed. Forming the curvature depicted in *C* is most easily carried out with a hand graver; but if a large batch of nuts had to be machined, it might save time if a form tool were made specially for the purpose. Where a milling attachment for the lathe is available, the nut flats can be milled to size, and the indexing is done either from a change wheel secured to the tail of the mandrel or by using a dividing attachment for indexing the lathe mandrel.

However, as shown in Fig. 10*D*, the flats can quite well be formed by using a filing rest secured to the lathe saddle. If none of this equipment is available, the nut will have to be screwed on to a length of rod gripped in the bench vice, and the flats are then filed by hand. Bearing in mind that the distance across the flats of a hexagon is approximately 0.867 of the full diameter, the bench worker, after making a simple calculation, can use a micrometer to enable him to file each flat to the correct depth, and at the same time the corner angle of 120 deg. is checked with a protractor. To avoid damaging the curved surface, it is advisable to slip a washer over the end of the nut to guide the file and keep it from moving too far inwards.

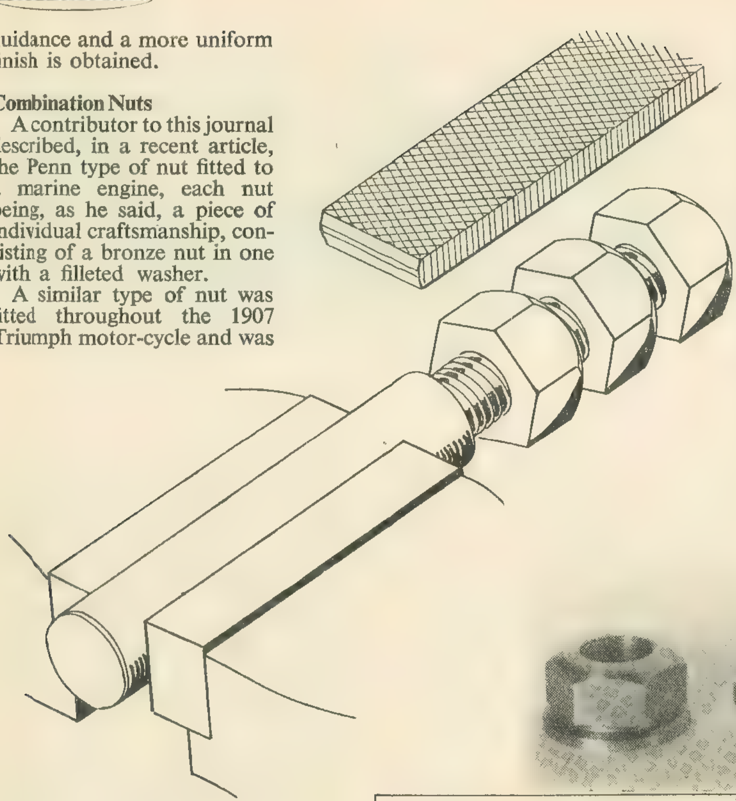


Fig. 8. A method of finishing the nut flats

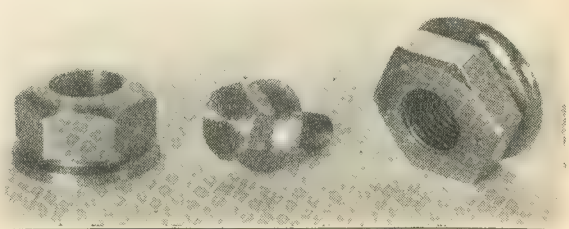


Fig. 9. Three examples of combination nuts

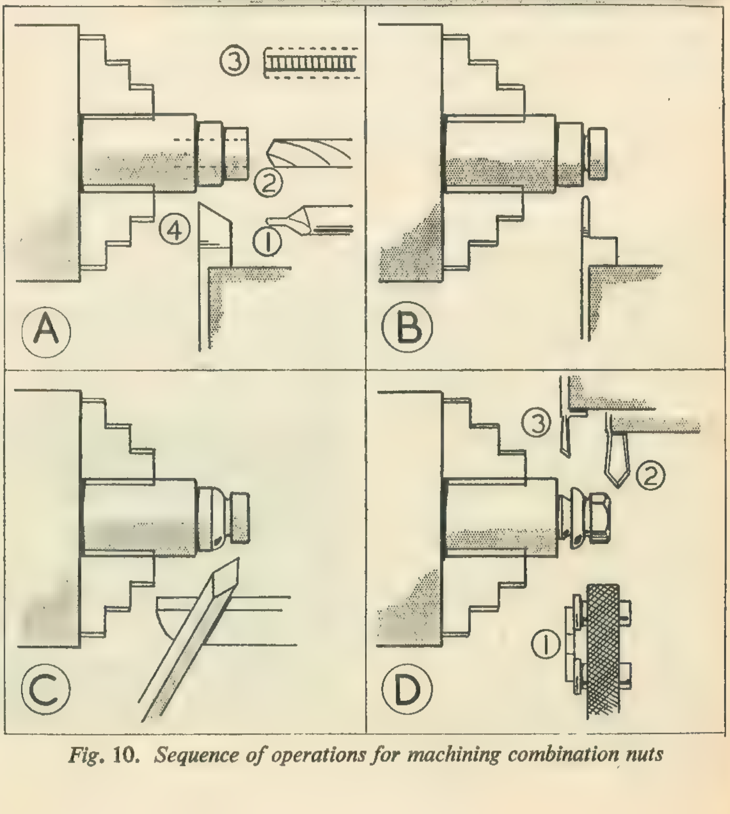
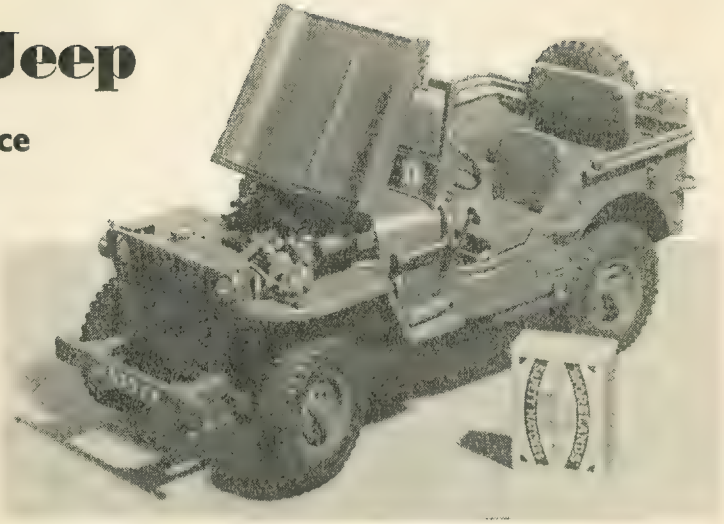


Fig. 10. Sequence of operations for machining combination nuts

A Model Jeep

By R. J. Wallace



The finished model. The matchbox is included for comparison of size

IN 1946 I was serving in the R.A.F. in the Far East and at the time in charge of Japanese prisoners, with the result that I had a certain amount of time on my hands, and looking around for something to do, saw a Jeep.

It had a lot of detail about it and I thought it would make an interesting model. It didn't occur to me that a Jeep was a mass-produced vehicle and to make a model that would look like the real thing, I would have to make tools to make the parts on; still, after about a year's work, during which time I was moved around quite a bit, the model was finished.

The first thing that I had to do was to get some drawings to work to, but as there were none available it meant making them myself, this was no small matter, as I was to find out. In all there were just over 300 separate drawings, half of which were obtained by laying on my back under the vehicle with a rule and paper and sometimes in the mud—still that's another part of the story !

Near-side perspective from rear end

Next came, what I think was my biggest headache and that was materials. I managed to find a certain amount of steel for the tools, but very little brass or tin. In the end I found a Zero fighter that had been dumped and in it there was some brass tube, and so by cutting it in lengths and sawing it down the middle, then flattening it, I had enough for my needs, and so the work proceeded for a bit.

When I said that my biggest headache was materials, I forgot to mention my tool kit. This was a standard service kit, the smallest file I had was a 6 in. flat, but by grinding it on one side, and then on one edge, I managed to press on and complete the chassis, less engine, transmission, and wheels.

I was then moved, and here my main difficulties began. In my last place I was at least under cover, but now, if I was going to complete the model at all, I was going to have to change my plans, as I had nowhere to keep the model—at least the chassis. The thing was: " do I or don't I go on with it ! " I think many a modeller has been in the same position as I was, except that in my case, if I was to go on with it, it meant that it would have to be built out of doors on a bench with no vice. After looking at what I had already done, I said to myself, " if you are going to carry on you will need that little extra patience "; and now, looking back, it is surprising what you can do if you don't get impatient.

One particular incident I well remember. I had to make some more drawings, and after laying in the mud on my back for an hour or so I drew what I thought I wanted and made some rather difficult folding tools to make the necessary parts, and had in fact made them, and was trying to fit them, when to my surprise they just would not fit. So crawling back under, I rechecked and found that I had not made a mistake on my drawings.

I just could not understand what

was wrong, but after more re-checking I soon discovered where things were going adrift. No one had told me that there were two types of Jeep, one made by Fords, and one by Willies, and there is a slight difference, enough to make me scrap the fittings I had made, and so I had to start all over again.

Getting back to the model; as the work proceeded, much more thought had to go in to the planning, as most of the fixing had, up till now, been done by riveting, these I made by putting ordinary pins in the drill brace and turning them down until they were small enough. Now that I had built the engine, I had to get the soldering-ron under way, and here is a tip to anyone who finds soldering several small fittings close to one another, difficult.

I had never built a model in metal before, and as I soldered one fitting near another, it very often used to melt the solder on the fitting next to it, with the result that it fell off, and as I had no one to help me I found that by using several types of solder, starting with the one with the highest melting point first, and finishing with the one with the lowest I overcame this difficulty.

I mentioned above about planning! What I mean by this is that when one is soldering a model together like this, if you don't give a certain amount of thought before you start fixing things together, you will find that you won't be able to get the iron in the corners and awkward places, so you will find as I did, it does pay *not* to want to see the model looking complete too soon. I think that is one of the most important things to remember, and one of the things that has spoilt more models than anything else. As a matter of fact, while I was making this Jeep a friend asked me if he could use the tools that I had made, and build one too; so I said, yes. I had gone ahead with mine, and although he made the parts quite well, he wanted to see it look like mine, but he soon found that he just could not solder the thing together and so he gave up, only for that reason.

I managed to get the use of a lathe in a mobile workshop and did all the turning on this, but this was the only machine I used. The day came when the model was almost complete except for the wheels and tyres.

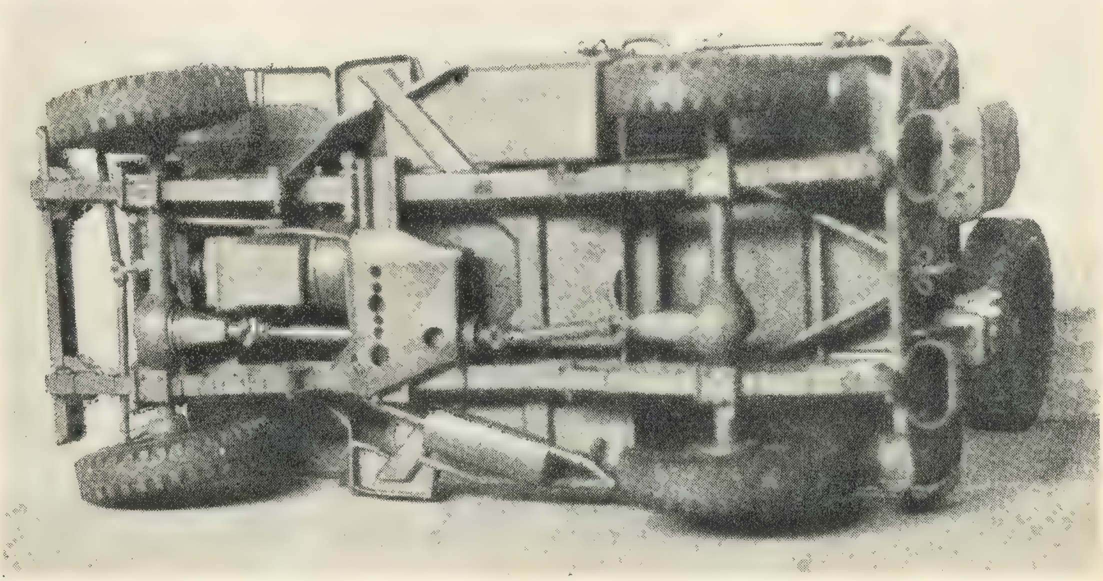
I tried to get small rubber tyres in the shops, but although there were rubber trees everywhere, there were no model tyres to be had, so in the end I turned them up in wood with the wheel complete, and painted them with blue black ink, which made them look just like rubber. The tread was one of the most monotonous jobs on the model.

I had to file the tread as well as mark out each groove opposite one another, and I could only stand filing one quarter of a side each evening. Although I do not consider this model a first-class job, I did feel I had overcome any impatience I had in me, for without patience I don't think I would ever have built it.

The last job that gave me some trouble was the windscreen. I could not get any celluloid in the shops and so I finished up with a small piece that I found in a Japanese ammunition box, which unfortunately had gone slightly yellow, but it was all I had, and so I made the frames up, but every time I put the soldering-iron near it, it caught fire—often when I had nearly finished it. In the end, after making three, I hit on the idea of holding a wet rag near the iron and celluloid, and this overccme the trouble.

I think that completes the story of how it was built, except one funny thing—at least, I don't know if you would call it that or strange. The model was mostly built outside in the open and most of the time I was working on it, we had rain and severe thunder storms. Right up till quite recently every time I brought it out, sure enough, we would get a storm which caused quite a laugh.

On a model of this size (1 in. = 1 ft. scale) which makes it $10\frac{1}{2}$ in. long, it is impossible to make the engine work, but I did manage to make the following items do so. Steering gear, including steering-box, windscreen and wipers, springs and shock-absorbers, engine fan, bonnet hinge and clips, towing hook, brake and clutch pedals, front seat, cubby hole door, hood framework and fire extinguisher brackets. The model weighs $3\frac{1}{2}$ lb., which, strangely enough, is nearly scale weight.



Under-side, showing completeness of detail

BRITISH CRAMPTON LOCOMOTIVES

By E. W. TWINING

PART 10

WHEN the writer commenced this history of T. R. Crampton's outside cylinder, stern wheel, type of single driver engines built in this country for British railways, it was intended that only those originally constructed as such should be included. It was stated that there were, in all, twenty-five Cramptons of this type, of which twenty were originals, the other five being the results of conversion. It now seems desirable, in order to render the history complete, to include these five, since the origin and methods of conversion are interesting.

All of the engines concerned were running on the South Eastern Railway and all were of the Stephenson "long boiler" type with the wheels in front of the firebox. There were two classes, the first with the 2-2-2 wheel arrangement and the other of 4-2-0 type.

The first lot: the 2-2-2, built by Nasmyth and Co. of Manchester, in 1845-6, consisted of seven engines, all alike, with 5 ft. 6 in. driving wheels, 15 in. by 22 in. outside cylinders and were numbered 88 to 94 on the South Eastern. These, like most long-boiler Stephenson engines on other lines as well as the South Eastern, oscillated violently, with a horizontal nosing motion, about the centre of gravity and Mr. J. I. Cudworth, the locomotive engineer to the South Eastern, from time to time, rebuilt them all in various forms. Only one: No. 92, was converted to Crampton's stern-wheel type and this was carried out in 1848, under Mr. Crampton's personal supervision, from drawings prepared by W. Williams, who was, at that time, chief draughtsman at Ashford works.

Williams's drawings, which are still in existence, state, in writing, that the driving wheels were six feet in diameter but, as the centre-line of the cylinder and motion above the rail, is by scale, only 2 ft. 9 in. and as the wheel diameter scales but 5 ft. 6 in., the latter must have been the correct figure. The cylinders, after conversion, were made according to another inscription on the drawing: 15 in. by 18 in. but the stroke too must be an error for the throw of the crank scales 11 in., so the piston travel, like the driving wheel diameter, must have remained unaltered. The wheels were all of built-up form, composed of T-section iron, each spoke being formed by the placing together of the heads of two T's.

The barrels of these "long" boilers were made up of six strips of plate with no circumferential seams, so there were no less than six longitudinal riveted lap joints in the barrel, each with only a single row of rivets on each seam. The fireboxes were of the tall haycock or, as they have sometimes been called, "Gothic" form. This haycock functioned as a dome, the steampipe being led from the top of it and the regulator was immediately underneath.

Mr. Williams was the co-inventor, with Howe of the Stephenson link valve-gear and it was but natural that, in laying out the scheme for the conversion of No. 92 and other S.E.R. engines, he should adopt this gear. Rocking shafts had to be provided to take the motion from the die blocks in the expansion links to the valves, the steamchests being placed inside the frames. Feedwater pumps of large bore and short stroke, were under the footplate, driven by eccentrics on the driving axle.

The writer has a small blueprint which came to him from Ashford as long ago as 1906 and it is from this that the drawing of No. 92, shown in Fig. 23, has been prepared. The end elevation, Fig. 24, has been drawn by simple projection from the side view. The remainder of the principal dimensions are as follow: Diameter of leading and intermediate wheels 3 ft. 6 in. Wheelbase, leading to intermediate 8 ft. 0½ in. Intermediate to driving 7 ft. 11½ in. Total 16 ft. Overhang of frames at leading end 4 ft. 11½ in., at rear end 3 ft. 1 in. Cylinder centres, 6 ft. 1 in. apart.

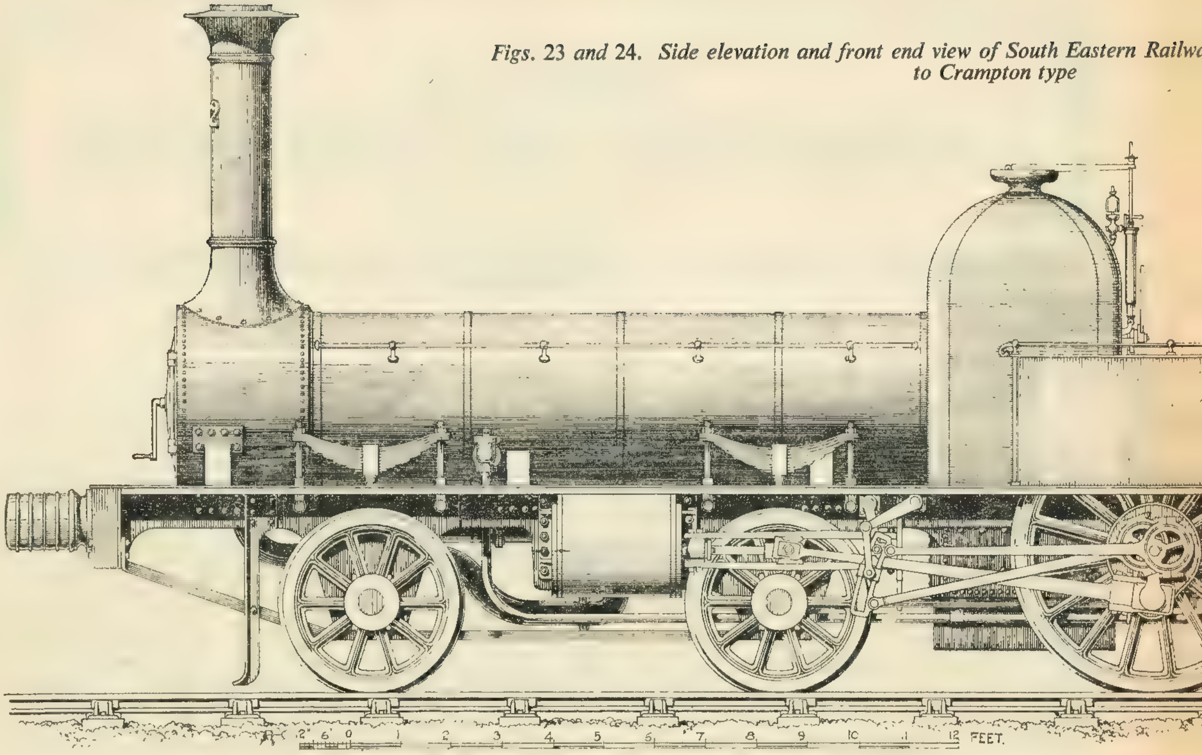
The boiler barrel was not truly circular, but had a vertical diameter of 3 ft. 3 in. and a horizontal diameter of 3 ft. 0 in. The length of the barrel was 12 ft. 6 in. and its centre-line above rails was 5 ft. 9 in.

The firebox was square in plan and measured, outside, 3 ft. 8 in. each way. The grate area was 10.56 sq. ft. The number and diameter of tubes through the barrel are not known to the writer so it is impossible to state the heating surface. The working pressure is also unknown but was probably in the region of 90 lb. per sq. in.

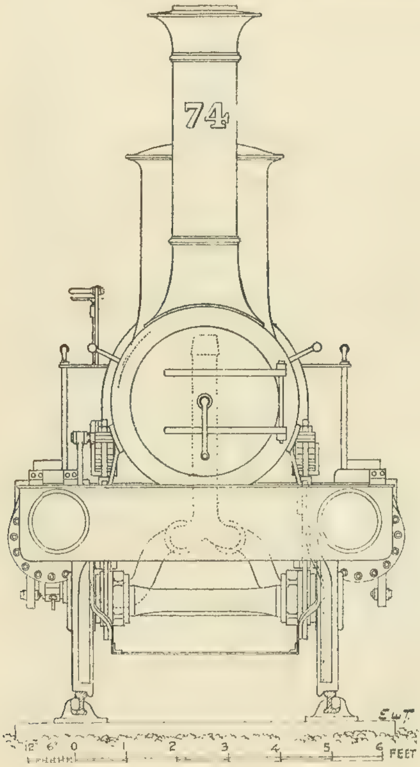
No. 92 was twice reboilered; the first time, so it has been said, with an ordinary round-topped firebox and a dome on the middle of the barrel. Although of small power, so successful was the conversion and so useful did this engine prove, in light traffic, that it had the longest life of all the stern-wheel outside cylinder British Crampton engines and was not scrapped until 1875.

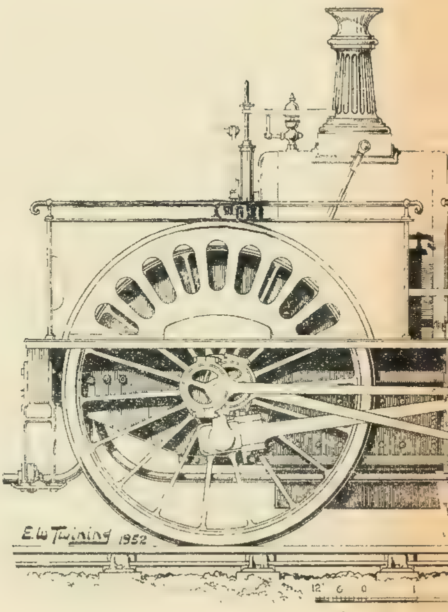
The other class referred to comprised six engines of 4-2-0 type, again with all wheels under the boiler barrel. These were constructed by Bury, Curtis and Kennedy in 1848 and bore South Eastern numbers: 68, 69, 72, 74, 75 and 78. They are said to have had, when first delivered Bury's bar frames. Four of them, believed to have been Nos. 72, 74, 75 and 78, were selected by Mr. Cudworth for conversion to Crampton type and, after rebuilding with plate frames and driving axle behind the firebox, presented the appearance shown in Figs. 25 and 26. These illustrations have been prepared by the writer from a small drawing made by, or under the supervision of the late Alfred Rosling Bennett. From what source Mr. Bennett obtained his data the writer does not know but, apart from one or two technical inaccuracies, which

Figs. 23 and 24. *Side elevation and front end view of South Eastern Railwa*
to Crampton type

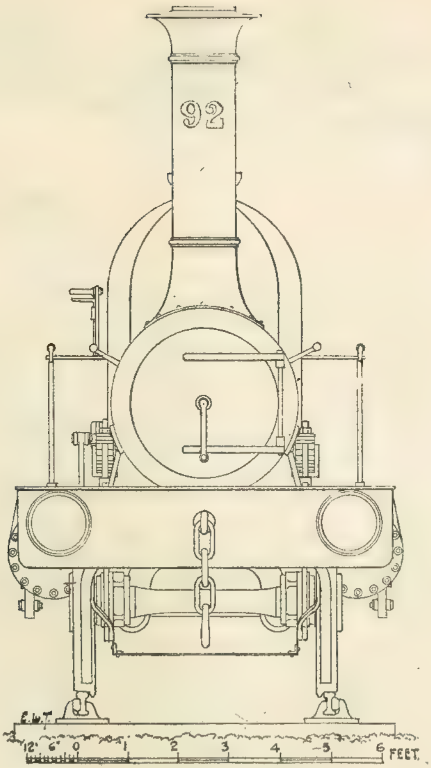


Figs. 25 and 26. Front end view and side elevation of the South Eas
and 78, converted to Crampto

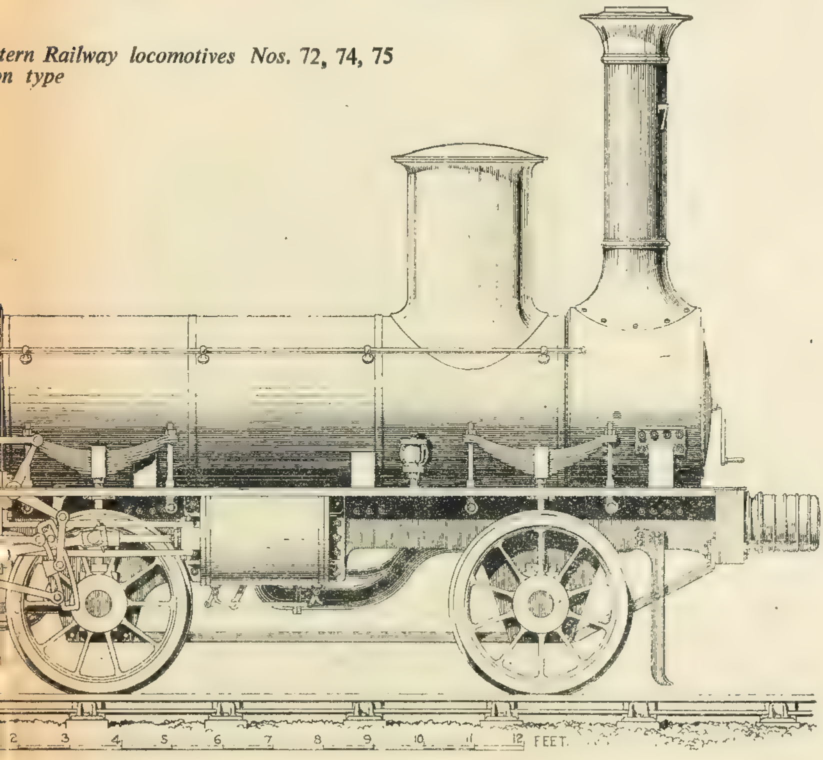




...ay locomotive No. 92, converted



...tern Railway locomotives Nos. 72, 74, 75
...n type



have been put right in the accompanying copies, such data can, it is believed, be relied upon.

These four engines had 15 in. by 22 in. cylinders, 6 ft. driving wheels and four carrying wheels all of 3 ft. 6 in. diameter. The wheelbase was: leading to intermediate, 8 ft. 9 in., intermediate to driving axle, 6 ft. 6 in., total 15 ft. 3 in. Overhang of frames, front end 3 ft. 6 in., rear end 3 ft. 3 in. Boiler centre above rails, 5 ft. 7½ in., rail to top of chimney 13 ft. 4 in. The steamchests were between the frames, the valves actuated through the medium of rocking shafts and feed pumps were under the footplate, all as in No. 92. No other measurements than those given are available. Mr. Bennett records that they were fast runners and gave excellent service, from which they were withdrawn, as is believed, in 1874.

The foregoing is all the information which can be given regarding the five engines which were converted to Crampton type, with the exception of the painting and polished metal parts. All five were painted the standard dark green of the South Eastern. This on the boilers, footplate side sheets, springs, wheels and splashers. The frames, ends of buffer beams, the angle under footplating and the cylinder lagging were a deep indian red; the colour on the cylinder being in a panel, bordered with black and with a fine line of white separating the red from the black. Boiler bands were black, edged white and on the footplate side sheets of No. 92 there was a broad, black panel band having cut-in, radiused corners, fine lined white.

Tender sides were, of course, similarly panelled.

On No. 92 the only polished brass was the large saucer-shaped ring around the safety-valves on the firebox top and the check valves on the boiler sides. The chimney top was black.

On Nos. 72, 74, 75 and 78 there was much more bright work; the chimney tops were of polished copper. The dome, the bell-mouth of the fluted safety-valve column, the front and back corners of the raised firebox and bands around the driving wheel splashers were all of bright brass.

The Nasmyth engines, of which No. 92 was one, all had the wooden lagging on the boilers exposed and painted when first delivered but No. 92, either at the time of conversion or shortly afterwards, had cleading plates added.

L.B.S.C.'s Lobby Chat

• GREETINGS AND THANKS

ALTHOUGH by the time you read these notes, 1954 will be well away on the main line, notched up and going strong, all set for a good run (we hope so, anyway !) as I write them, she is just pulling away from the terminal station; so my first duty is to thank all those good folk who sent greetings. It was a record; from the start of the week before Christmas, when 27 arrived by the first post, they were rolling in at the rate of twenty or more by every delivery. If ever I had any doubt that I had friends all over the world, it is now dispelled for ever! It seems a poor response, just to say, " thank you, brothers all," in cold print; but it is heartfelt, all the same, and as it is a physical impossibility to acknowledge them all individually, I guess you'll understand. I've managed to send direct acknowledgments to a few friends—went out and posted 31 letters on the Sunday night, at 11 pip emma—and by the time I'd finished those, on top of the weekly dose of writing and drawing, I was just about " all in." To the many who expressed the hope that I should long continue to carry on, I can only say that as long as a kindly Providence permits, I shall do my best as always; and to everybody who reads these words, I wish health, happiness, and good steaming during the year, and right onwards. Green lights all down the line !

British Locomotives Overseas

Some of the letters contained information about what the writers and their friends were doing, and photographs were enclosed. One such, was from Harry Cook, of San Francisco, a member of the Golden Gate Live Steamers. Incidentally, there are two members of that brotherhood who are resident in this country, Mr. Len Truett, who built the original 5-in. gauge L.M.S. 2F 0-6-0 tank engine, and your humble servant. I am also a member of the South Californian Live Steamers, and a few more transatlantic and colonial brotherhoods; " hands across the sea " ! Harry sent the reproduced photographs of his *Juliet*, and a *Maid of Kent* which is well under way; this is interesting, as it is being built to the correct gauge for " 1-in. scale," viz.: 4¾ in. This gauge is practically standard in U.S.A. and Canada, for locomotives of this size; most of the builders work to one-twelfth of the dimensions of the full-size engine, for which the gauge is, of course, correct.

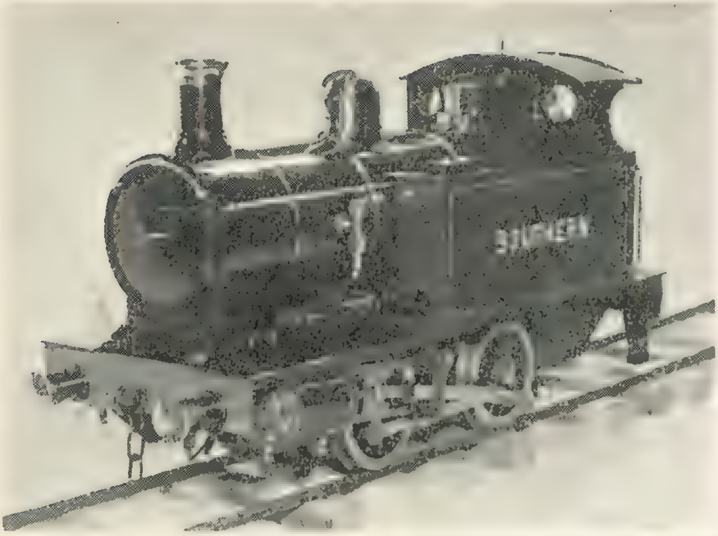
While on this subject, beginners sometimes ask why this isn't done in this country, to make " scale " measurements easy for those who like the " externals " to be in proportion to full-size. They argue, and in my opinion quite rightly, that it is better to reduce the overall dimensions of a locomotive to one-twelfth, or one twenty-fourth, and use the correct gauges for those sizes, viz.: 4¾ in. and 2⅜ in. than making the gauges " even figures," 5 in. and 2½ in. and then having to fool around with a lot of fractions in reducing the dimensions of the full-size engines to suit silly " scales " of 1 1/16 in. and 17/32 in. to the foot respectively. Well, it's just a relic of the times when the " big-boiler-and-barn-firebox " ideas held sway. Folk who built locomotives to " ½-in. scale," spread the gauge to 2½ in. so as to scrounge the last farthingsworth of firebox width; and the " 1-in. scale " merchants doubled it, naturally. When at last they " knew better," in a manner of speaking, there were a number of lines laid to 2½-in. gauge, and a lesser number to 5-in. with rolling stock to suit. It was obviously easier to build future locomotives to suit existing gauges, than alter the latter; thus it is that to keep locomotives proportionate to the rail gauge, they have to be of " fractional scale " dimensions. Well I know it, too; it gives me the proverbial pain in the neck, to do the jerry-wangling that is necessary to get the externals about right, when making drawings for some of the engines described in these notes.

I've often blessed the fact that the 3½-in. gauge escaped. A " ¾-in. scale " locomotive is one-sixteenth full size ; and 1/16 of 4 ft. 8½ in. works out at 3 17/32 in. (at least, it did when I went to school) which is near enough to 3½ in. to make no odds. Most 3½-in. lines are spread the odd thirty-second on the curves, anyway; mine are. When reducing the dimensions of a full-sized locomotive, to suit this gauge, all I have to remember, is that every inch on the big engine, is 1/16 in. on the little one, and the job is just a piece of cake.

Returning to Harry Cook's engines, the pictures show the workmanship he has put into them, and no elaboration is necessary. The finish is excellent, too, the painting and lining being very neat, and the hand-painted lettering on the side tanks very nicely done. *Juliet* is done in the regular Southern green, with red buffer-beams and German-silver boiler bands. The *Maid* (of California ?) will have outside cylinders and a round-topped firebox, and will be finished off in the old L.M.S. colours. Nice work, Harry; hearty congratulations.

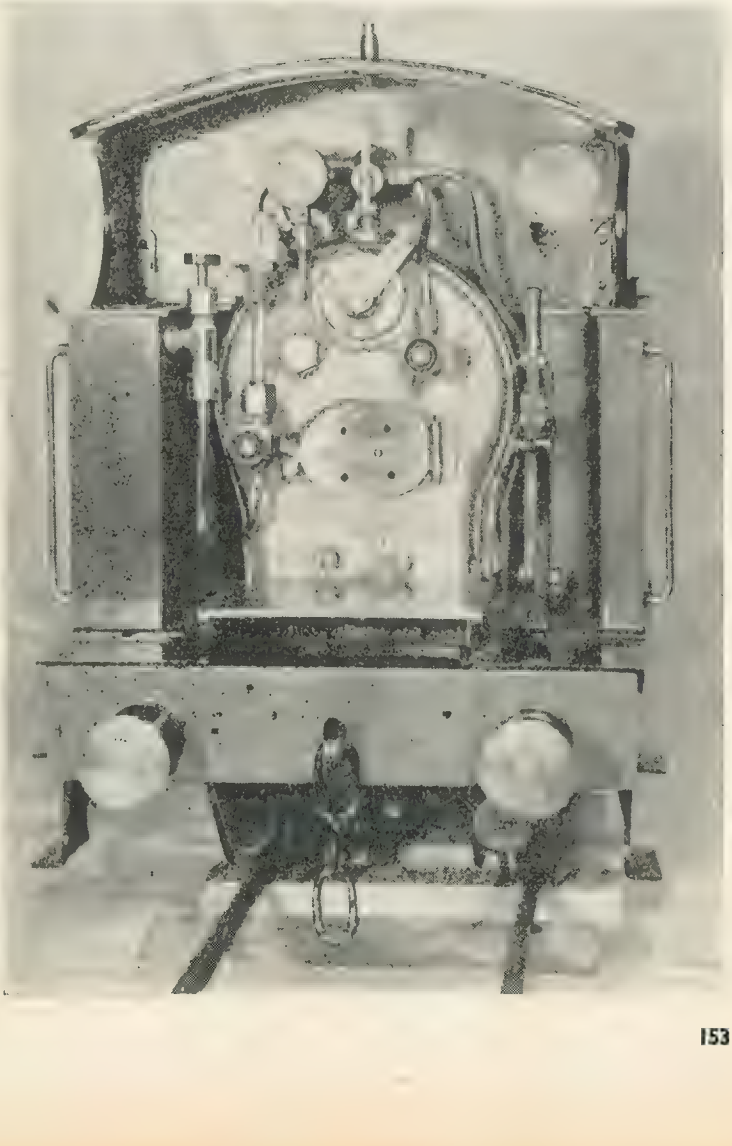
Circular Fireboxes

Our worthy friend enclosed in his letter, a sketch of an American old-timer that he intends to build; she is a 4-2-0, something like the Norris engines that worked on the Bromsgrove Lickey incline when the Birmingham and Gloucester line was first opened. The cylinders are outside, and inclined; but what puzzles our friend, is that under the slide-valve spindle, and between it and the cylinder body, there is what looks like another valve spindle, connected to a lever at the footplate end. He asks information as to what it operates. According to some old drawings I had, there was a crude form of reversing-valve in the steamchest, between the slide-valve and the port face. I don't know, naturally, if the builders of the engine that friend Harry Cook is copying (Eastwick and Harrison, of Philadelphia; date of construction 1842) used the same device, but probably they did. The drawing referred to above, showed a single eccentric for each cylinder, set at



Harry Cook's Californian-built "Juliet"

Right — Cab view of the Californian "Juliet"



right-angles to the main crank, which drove the valve spindle via a rocking-shaft at the footplate end. The reversing-valve was a flat plate with a weird and wonderful arrangement of ports and passages in it, so arranged that when in "back gear," steam from the front port in the reversing-valve went to the back port in the cylinder, and vice-versa, causing the locomotive to run backwards. For forward gear, there was, of course, "straight-through" connection between the the ports in both reversing-valve and cylinder portface. Incidentally, this idea has been used on small toy locomotives.

Regarding the firebox, this form of construction was used in this country, principally on the engines designed by Edward Bury, who was also a great advocate of bar frames, another idea which "emigrated." The inside firebox was of an exaggerated D-shape, the curved part following the contour of the outer wrapper for a little distance past the centre-line. The ends were joined by a flat tubeplate, the width of which was a little less than the diameter of the firebox across the transverse centre-line. That sounds very "scientific," and not like Curly at all, so maybe I'd better say that in plan, the firebox looked like a half-penny with a bit snipped off it. The tubes were fitted in the usual way; and the firebox had a flat top, with girder stays, on some engines, while on others it was domed, like the outer shell. This form of construction was pretty strong; better, in fact, than the form used by the builders of the *Titfield Thunderbolt*, as the only staying needed, was the lower part of the flat tubeplate, the rest being just as resistant to pressure as the usual form of vertical boiler. The drawback was the limited size of the grate area. However, in a little engine, with a good draught, and superheater, the old-time boiler should prove quite a good steamer. The domed top of the firebox shell could be a casting, same as the "Tit."

Another "Emigrant"

Soon after the 5XP class of 4-6-0 three-cylinder locomotives came out, an old correspondent friend,

Mr. S. Summerscales, of Cosham (I dubbed him "Bro. Two Dollars" because he always wrote his initials like dollar signs) built a 3½-in. gauge edition of the original one which the L.M.S. named *Silver Jubilee*, and finished off in a very posh style, with plenty of shiny black enamel and chromium plate. Another correspondent of long standing, Mr. Jim Tuling, of Johannesburg, had a yen to own this locomotive; and when a friend of his, none other than Bro. George Perrem, of the same locality, visited this country some time ago, the latter contacted "Bro. Two Dollars" and purchased the engine (for a little higher figure than two dollars ! !) on behalf of his friend. He didn't take it back with him, but it was shipped on later ; and—as usual—suffered damage on the way out, the South African Railways being the culprits. Funny how these people always get jealous isn't it ? They don't seem to like other engines running over their road ! Anyway, after arrival, George got busy and restored the little 5XP to the *status quo*; and in the picture on page 155, you can see him getting up steam on her, for a trial on his testing stand. The two interested spectators are Jim's son Derry—Jim is of Chinese descent—and Jay Ba, son of an Indian friend, both budding locomotive engineers. George himself being South African, and the locomotive British, the little gathering was of quite international status, very friendly and peaceful, at that. I often, wonder when writing to some overseas correspondent on locomotive topics, why world affairs can't be discussed in the same friendly way; a steam locomotive is a far better background than atom bombs. Maybe the so-called "leaders" of the people of the world, will one day think in the same strain. It would be Heaven's own mercy—nuff sed !

Steel Boilers Again

Once more the everlasting question of the suitability of steel for small locomotive boilers has arisen ; a newcomer to our craft, who is building *Britannia*, says that according to current prices, the cost of the sheet copper, tubes, and sundries for the boiler which I specified, is quite beyond his resources. He is, however, in a position to obtain sheet steel and tube, at a price which he can afford; and also has a friend who is an expert in steel welding with an oxy-acetylene blowpipe, as he earns a living at the job. The querist says that he realises that rusting and pitting would take place in a steel boiler, but says that he could counteract that by using ⅛-in. plate throughout, with tubes of corresponding thickness. His friend says that if ⅛-in. steel plate and thick tubes are used, no flanging would be needed, steel-welded joints being stronger than the parent material, when properly done. Would I recommend a boiler made thus, as satisfactory, as a substitute for the one specified, as he doesn't see any prospect of being able to afford the latter.

Well, there is just one snag, and if our good friend of the shallow pocket doesn't mind taking the risk, he can go ahead. A boiler made of ⅛-in. steel plate, with properly-made steel-welded joints, would certainly be immensely strong; in fact, it would need very little staying, for a working pressure of 80 lb. if made to the size specified for *Britannia*. This thickness of steel plate, with corresponding tubes and flues, would last a long time before the rusting and pitting became serious; and the weight of the boiler would be an advantage, especially if the axleboxes have the ball and roller bearings specified, as it would help to prevent slipping. The drawback is the inefficiency of a thick steel plate as a heat transmitter in a boiler. At a rough estimate, I should say that she would be at least three times as long getting up steam as a copper boiler built to specification; and whilst the boiler might maintain steam pressure on the run, it would be nothing like as lively as a copper one. However, a steel boiler is better than no boiler at all, and it could be replaced by a copper one if favourable circumstances should arise, so I wish my new correspondent the best of luck, and should be glad to hear how the job pans out. It would be as well if he blew down the boiler after a run, while there is still about 20 lb. showing on the gauge, and left the blowdown valve open. The heat remaining in the boiler plates would dry out the inside, and so minimise the tendency to rust while the boiler was not in use.

Incidentally, an old correspondent, Mr. Lynas, of Loughborough, once made a boiler of ⅛-in. steel plate, with electrically-welded butt joints, thus anticipating the Southern "spam cans" by many years. This boiler had the slow-steam-raising trouble; but Mr. Lynas said that on the other hand, the boiler was slow to lose pressure when finishing a run, and steamed for a short while after the fire went completely out, due to the heat stored in the thick plates. He didn't say how the boiler behaved when the engine was on the run, and as he long since parted with the engine, cannot now make any tests; but he is fitting a copper boiler, as specified, to the *Molly* that he is now building. Although a steel boiler is perhaps justified, in a manner of speaking, in circumstances as mentioned above, I should never dream of recommending steel, in preference to copper, where the latter can be obtained. A copper boiler, well stayed, with flanged joints properly brazed or bronze-welded, cannot be beaten for strength and efficiency combined; and that is why I always specify them for the locomotives described in these notes.

A Maid of California grows up !

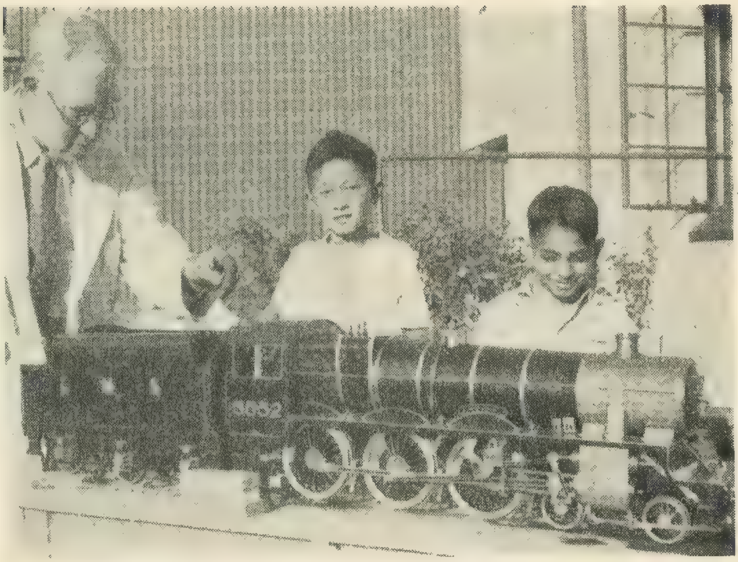
Speed of Donkey Pumps

It is a curious thing, but absolute fact, that if I happen to make any

assertion, and say that I will explain further in subsequent notes, some good folk never wait until they see what the further explanation may be; either I get several argumentative or contradictory letters, or somebody hastily rushes into print, in similar strain. Now if I might give our very good friend Mr. L. A. Burville, of Eastbourne (whose letter appeared in the last-day-of-the-old-year issue) a friendly poke in the ribs, he really should have waited for that same further explanation before wasting paper, ink, and precious time. Incidentally, will he accept my hearty congratulations for the fine job he has made of the locomotive? She looks a real smasher.

I have received, from time to time, letters from readers who have made up the little duplex donkey pump described in detail in the *Live Steam Book*, and also other pumps of similar size, single and twin cylinder. In quite a number of cases, the writers have stated that whilst the pump can be run very slowly indeed on air pressure, it will not operate nearly as slowly on steam, and they are frankly puzzled. The original pump which I made for *Fayette* many years ago, the one now on my *Caterpillar* (28 years old) and the single-cylinder donkey on *Fernanda*, all have the same characteristic; yet one which I made for a friend, will work as slowly on steam, as on air! At first sight, this seems a bit of a Chinese puzzle, yet the explanation is very simple. The first three are mounted on the side of the boiler, and supplied with wet steam from a valve on the backhead. The "Cat's" pump, in particular, has a long exposed steam pipe. My friend mounted his, at my suggestion, on the side of the smokebox, and supplied it with steam from a union on the smokebox tubeplate, the pipe passing around the inside of the smokebox, right in the hot gases. The regulating valve is on the side of the smokebox, and is a replica of *Jeanie Deans's* warming valve, operated through the handrail. Did I hear somebody say "Aha!—now *we* are getting warm, too!"

To put it in a nutshell, the trouble is simply due to the condensation of wet steam in the tiny drilled passageways of these Lilliputian pumps. These passageways become partially or sometimes completely filled with water, and the steam valve has to be opened fairly wide, to blow it out. You'd be surprised to find out what pressure is needed to clear water from a hole less than $\frac{1}{16}$ in. diameter, going through a casting, or other block of metal, with right-angle or other sharp bends in it As soon as the water has blown away, steam naturally rushes into the cylinder and makes the little piston step lively. Then, as soon as you close the valve a little, to reduce the speed, steam starts to condense in the passages again, blobs of water form, and as the reduced pressure cannot blow them out, the clock stops. Therefore, the steam valve has to be kept open sufficiently to keep the little passages free from condensation; and the amount of steam needed, is sufficient to keep the pump running fairly fast.



No dissention at this meeting of the not-so-big "Four"!

With air, of course there is no condensation, as a friend found when he tried to test an injector by air pressure; as the passageways, no matter how tiny, keep perfectly clear, the air pressure can be throttled down so that the pistons hardly move. It is hardly necessary to add, that with cylinders as large as $\frac{5}{8}$-in. bore, the ports and passageways are far too large to be choked with tiny drops of condensate water; and, therefore, provided that the workmanship is O.K. and the reversing-valve and shuttle properly adjusted, a pump with a $\frac{5}{8}$-in. bore cylinder should work as slowly under steam pressure, as it can be made to do on air pressure. This fact accounts for the milk in friend Burville's coconut. Had his pump been about half the size, with weeny passages, or small pipe connections, he would have confirmed my statements instead of querying them.

The Remedy

The obvious way to cure the trouble, is to get rid of the condensation; and that is easily done by supplying the pump with superheated steam. As an experiment, I disconnected the steam pipe on the "Cat's" pump, and replaced it temporarily with a long pipe with a coil in it. The boiler was then steamed up, and a bunsen burner placed underneath the coil, to heat it. When steam was turned into the donkey-pump, it jerked and spluttered for a few seconds, spat a few drops of water out of the exhaust pipe, and then settled down to a steady tick, which could be regulated to any desired number of strokes per minute. The steam, passing through the hot coil, itself became too hot to condense in the pump. On removing the temporary "superheater," and replacing the original wet steam pipe, the pump resumed its "won't-go-too-slow" performance.

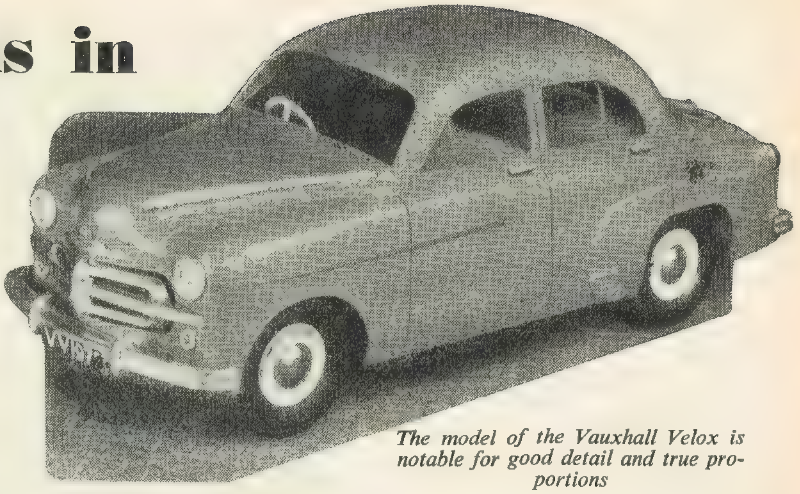
When I made the donkey-pump for my old friend, I told him that it wanted hot steam, and should be mounted on the side of the smokebox, so that the pump itself should be as hot as possible, to ensure a quick start when steam was turned on. The steam connection that I recommended, was as described just above. These instructions were faithfully followed, and the pump has worked perfectly from the day it was first installed. I intended

(*Continued on page* 160)

Car Models in Quantity

By

J. Dewar McLintock



The model of the Vauxhall Velox is notable for good detail and true proportions

ALL engineers know that mass-production of any article depends for its success upon a high degree of accuracy in machining and other processing operations. Standardisation is the essence of large-scale production but is not possible unless work is done to very fine limits.

This principle is applied successfully to the quantity-production of models by a Guildford, Surrey, concern, and an account of the activities of this company may be of interest to model engineers, as an illustration of what can be done in the way of accurate repetition of small-scale components. The models in question are already well known, as a result of widespread publicity, and in case there may be an impression that they are merely toys, it should be pointed out that they serve in most cases more as accurate small-scale miniatures.

The professionally-built model may thus come into the scheme of the large-scale industrialist in two ways—first as an experimental miniature prototype, usually used in connection with the styling of new models—or secondly as a miniature of the finished production article, used for sales-promotion purposes.

This concern, Victory Industries (Surrey) Ltd., entered the field in a modest way some years ago, with non-scale models—in fact toys—which were powered by a most effective and ingenious miniature electric motor. This motor, the Mighty Midget, has been so successful that it is still the standardised power unit for the various models, although a modified edition has also been introduced for general and industrial purposes.

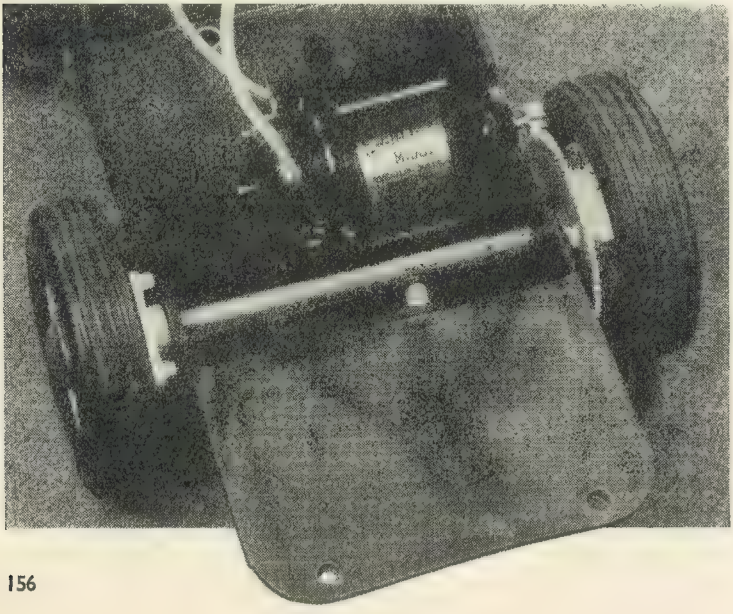
Scale models of current Morris Minor, Vauxhall Velox and Austin A40 cars are at present produced in large numbers, and some very interesting new projects are under way or already in production, and include replicas of the new M.G. sports car, the Leyland Comet steel-bodied tipper, the Vosper R.A.F. crash tender launch, and the Conveyancer fork truck. The last mentioned is particularly attractive as a working model, and it can lift and stack, as well as steer and run backwards and forwards. It is built to 1/14 scale, and like the other models it uses the Mighty Midget motor and standard torch batteries.

I watched work being done on the miniature prototype of the Leyland truck. The company employs a skilled model maker—a reader of THE MODEL ENGINEER of course—who executes the design from photographs and drawings of the subject, as well as by personal examination if necessary.

His first operation is that of pattern-making. Wood blocks are carved to the exact shape of the main assemblies, such as the lorry-cab, or in the case of a new car, the entire body shell. His next operation is to make prototype assemblies in the material to be used in actual production. This is normally either acetate or polystyrene, both of which are plastics.

This he does, in the case of a complex multi-radius form, by putting a sheet of the plastic over the hardwood pattern and playing a bunsen burner over it until it is sufficiently soft to be formed by moderate pressure. Acetate is, of course, a thermoplastic and not a thermosetting substance, and is thus very amenable to such treatment, although skill is called for if burning is to be avoided.

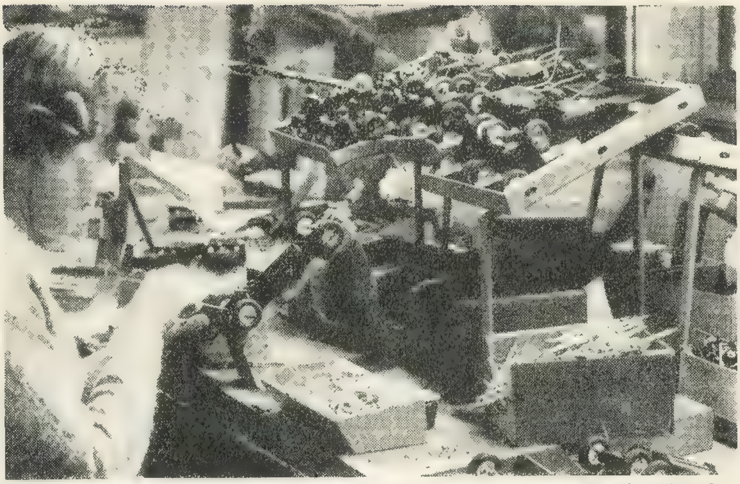
When the plastic is cool and rigid, the assembly is pierced where necessary—i.e. for windows, etc.—and



Left: How the miniature motor is mounted in the Vauxhall chassis

scraped and filed to make it absolutely accurate. The chassis, and other plastic parts in the case of some models, are fabricated from sheet. In the case of a "steel" tipper body, for example, the floor and sides are a single curved sheet of acetate, whilst the strengthening ribs, which follow the same contours in cross section, are made up from two thicknesses of the material cemented together after shaping. Dimensional accuracy is maintained at all stages.

Techniques used to produce metal parts—gears, axles, accessories and fittings of various kinds—are those of normal model engineering. There is a well-equipped machine shop, with lathes, milling machines, shapers, grinding machines, etc., such plant being necessary also for making up the various tools, jigs and dies used for assembly work.



Assembly benches are neat and clean. Production sometimes exceeds 400 *a day*

At all stages, however, the model maker must keep in mind that he is designing for quantity production, and simplicity and ease of repetition of the production job must be controlling factors.

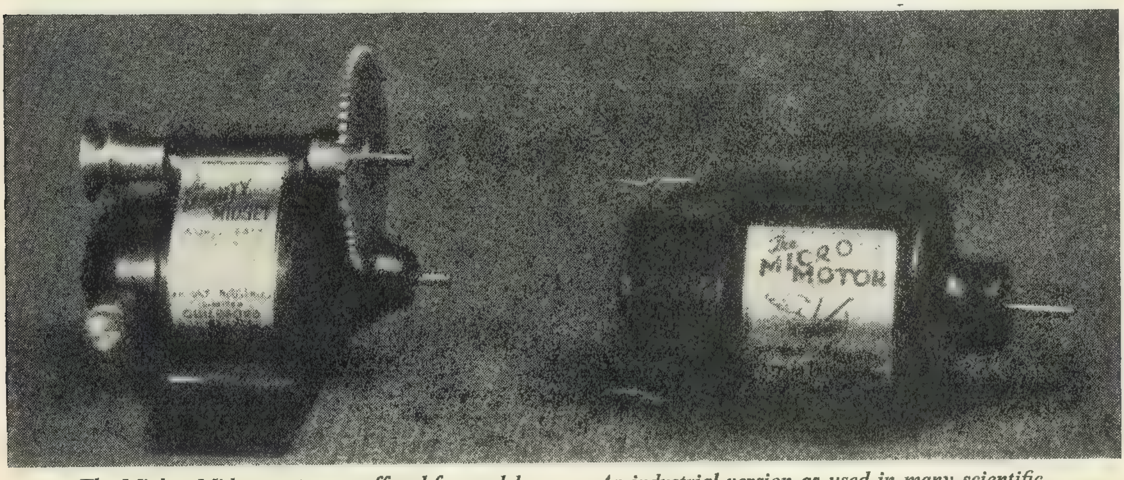
Materials may or may not be those used in the final production job, e.g., a stub axle may be machined from solid steel or brass but may be in fact a zinc-alloy casting in the final models.

Eventually there comes into being the prototype model. This is the master model for the toolroom, the injection-moulding contractors, and the die casters, who then get to work in their particular spheres to make mass-production possible. Injection-moulding plant is somewhat expensive, and this work is contracted out, as are the small number of zinc-alloy castings used. The company does its own tool making, however, and has its own press shop and final assembly lines. In this respect it forms a fairly close parallel with a full-scale set-up. Most of the workers are women, who are able to perform the delicate repetition work better than most men could do it. Readers will remember that instrument manufacturers during the war found that women were remarkably good at light assembly work, and the same applies in this instance.

This is seen to good advantage in the case of the shop where the miniature electric motors are assembled. These little motors are of very simple design, but quite a number of assembly operations are demanded, and these are all of a delicate nature.

I watched the coil winding with great interest. This was being done on a form of lathe designed and built by the company, and a girl was winding 49 turns of hairlike wire on each coil of the tiny sintered-metal armature, keeping an eagle eye on the rev. counter at the same time. There are many ingenious repetition machines in the motor assembly shop, and one of the most interesting is that which makes assembly of the brush gear such a rapid process.

The brush holders are small eyelets, in effect, and at the same time as these are pressed into the motor body, which is made of plastic, the brushes themselves—consisting of 5-thou. by 36-thou. phosphor-bronze strips—are pushed forward by the machine and locked



The Mighty Midget motor, as offered for model makers' use

An industrial version as used in many scientific applications

in place so that they bear on the commutator. The latter itself is a most ingenious piece of miniature engineering, being made from a three-pronged copper blank which is pressed into cylindrical form over an insulated sleeve. Fibre retaining rings are placed over the segments and the one-piece end of the blank cut off to make the three segments electrically separate.

Many readers will be acquainted with these little reversible-type motors, which have an armature-speed of 4-6,000 r.p.m. and a countershaft speed of 650-1,000 r.p.m. An industrial version has been produced and was given an excellent report by the National Physical Laboratory. It is interesting to note that this organisation had no test equipment suitable for so small a motor, and had to borrow the company's own equipment ! The industrial version of the motor—called the Micromotor—has copper brushes. Test results of the Micromotor have shown the following performance figures: Torque, 15 gm.-cm.; speed, 6,400 r.p.m.; consumption, 0.36 amps 12 volts. This represents an output of 43 ft. lb./minute and an efficiency of 23 per cent., states the company.

Female labour is also employed in the press shop, where there are ten hand-operated presses. All the tools for use in these presses are made up in the company's own toolroom, and many of them are of a highly ingenious character. Most of the small pressings are made from aluminium. A typical operation is the forming of tiny door handles for the cars. The whole operation is performed on one machine, which stamps out the blank, then forms it into shape and ejects the finished article. Radiator grilles are also pressed out, and careful tooling is required for these comparatively ornate structures.

The various components are put on to the assembly lines in batches, and thenceforth construction proceeds rapidly. There are no very complicated assembly operations, as far as the workers are concerned, but again, some of the machines are quite complex, and are excellent examples of tooling-up on the miniature scale. For example, each shatter-proof polystyrene body shell has to be pierced in quite a number of places for door handles, bumpers, number plates, front grille, and the like.

To achieve this, it is simply put on a machine and clamped in place. Two levers are pulled, and the hardened pins on the slides of the machine do the rest.

Certain parts are attached to the polystyrene by peening-over small bosses of the material. A thermoplastic material of this type is very amenable to treatment by gentle heat, and this peening process is carried out quite easily by the assembly workers after a little practice.

In certain other cases, small parts are attached to the main body structure by means of small tags of the metal, whilst a certain amount of simple soldering is involved where the battery contact-straps are concerned. Both for soldering and for peening-over of the plastic bosses, controlled-heat irons are used, and are completely safe in operation. Eyeletting is also used as a means of attachment in one or two instances, and simple presses are employed. All assembly benches are kept remarkably neat and tidy, and are a joy to see, with all manner of workstands at just the right height and angle, neat containers for parts awaiting assembly, clean, lightly-oiled jigs and tools, etc.

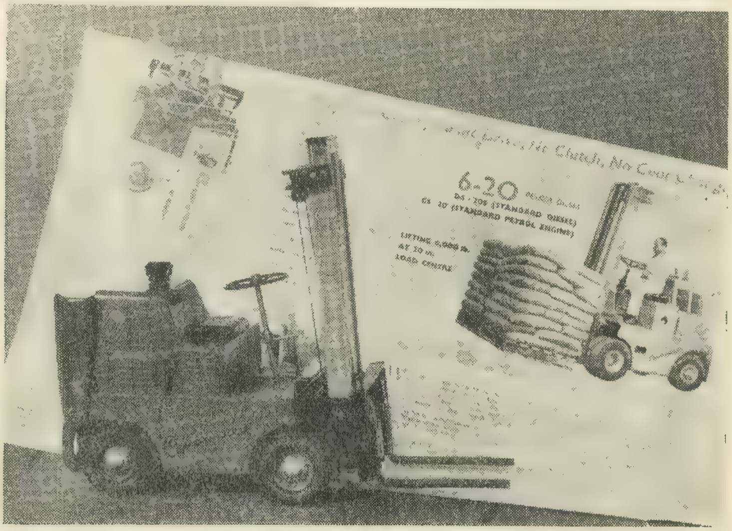
This company is making something in the region of 400 models a day at the Guildford plant. It has powerful backing from manufacturers of the full-scale products, not in the financial sense, but in the sense that their sales organisations all over the world handle these models. So close is the link that in some cases, manufacturers release their drawings for new models to the company, long before the official release date.

An interesting sidelight on the link with full-scale industry is that tyres for these models are made by Dunlop, Firestone, and Goodyear, in correct miniature tread patterns.

Development work on new projects is always of interest. For example, when research and experiments on the model Vosper launch were being carried out, it was observed that if a simplified shape was given to the twin screws, the performance was reasonable, but with correctly-contoured hand-made screws, speed was almost doubled. The problem was how to produce such screws cheaply and in quantity, and the answer—found after many other possibilities had been explored—was to make them in plastic and then have them brass-plated. This system works extraordinarily well, and the production launch has a speed of 5-6 knots.

Another problem was set when it was found that the soldered joint between rudder and rudder-post tended to deteriorate, due to the action of water on the residue of flux used in the soldering operation. It was decided that welding would provide the most satisfactory answer, and a conventional spot-welding machine has recently been installed. Intended for full-scale industrial use with ferrous metals, this will be fitted with modified electrodes for the smaller work, and will make entirely satisfactory "spots" on the brass, it is understood.

Current development work, apart from that concerning new models, relates to remote control by radio and mechanical means. In connection with the latter, it is interesting to note that a specialist has made miniature Bowden-type cables for the company. These have an outside diameter of only $\frac{1}{16}$ in.



The prototype model of the fork truck shown against a leaflet describing the full scale job

READERS' LETTERS

● **Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.**

"THE GROWTH OF THE TIDDLERS'

DEAR SIR,—It is rather unfortunate and somewhat surprising, to find that one or two inaccuracies have crept into Geoff Deason's otherwise excellent article, "The Growth of the Tiddlers."

Firstly, the motive power of Gerry Buck's "Wee 2" was an Elfin 2.49 c.c., *not* the 1.8 c.c. version as stated. Secondly, Cyril Catchpole's 1.5 c.c. record was 71.42 m.p.h., *not* 70.47 m.p.h., and thirdly, F. S. Drayson did *not* net the 1953 2.5 c.c. M.C.A. Championship.

Regrettably, the latter correction upsets the justification of the "return to geared drive" since my car, which won the event, is direct drive.

Strangely enough, the most successful 2.5 c.c. geared car to date is not even mentioned, namely Ted Armstrong's modified E.D. 2.46 engined car which has well merited the respect of the "Oliver Camp" on more than one occasion.

It first came into prominence by winning the Chaddesden Supporters Shield at Derby in June, 1951 at 76.27 m.p.h. and establishing a new M.C.A. Record, then won the 1952 European Championship and established the present European (F.E.M.A.) Record of 124.137 k.p.h. This was followed by the memorable 1952 M.C.A. Championship when, after a ding-dong battle with "The Catchpoles" 84.66 m.p.h. was returned against the winning 85.30 m.p.h. and later in the year at Nottingham (home of the Olivers) won the 2.55 c.c. event at 77.80 m.p.h.

Whilst on the subject of geared cars it is well to remember that the present 2.5 c.c. record is still held by direct drive at 88.23 m.p.h. (Mrs. Joan Catchpole) the nearest recorded approach to this by a geared car being 84.66 m.p.h. (Ted Armstrong), and I would suggest that the direct drive has much to commend it, with the possible exception of performance on inferior tracks, though, even this can sometimes be flouted, as witness the recent meteor meeting when, to confound the critics, myself included, my direct drive car won comfortably at 80.64 m.p.h. on a track which was an apparent paradise for geared cars.

Commenting on the historical side, I feel that the name of Oliver justifies both an earlier appearance and much more of the credit for the advent of the twin shaft unit. In fact, Olivers have "loomed large" since J. A. Oliver won the 2.5 c.c. event at the 1948 meteor meeting, establishing an M.C.A. Record of 55.50 m.p.h. in the process. The car concerned, "Newt," was powered by a J.A.O. twin shaft unit, forerunner of the black and chrome "Jaguar" and ancester of the modern "Tiger," this type of unit remaining the basic Oliver unit to this date.

One could write on *ad infinitum*, but, rather than risk militant action from the more intolerant readers (with possible consequent nipping in the bud of what appears to be the most welcome turning of a new leaf in editorial policy), may I conclude by congratulating Geoff Deason on an excellent article and urge more power to the very able elbow whilst at the same time imploring him not entirely to overlook the lads in "no man's land" during the recording of his annals.

Yours faithfully,
Sunderland. L. PROCTOR.

MAKING PISTON-VALVES

DEAR SIR,—I am at present building a 5-in. gauge 2-8-2 locomotive, the chassis for which is well advanced, and the design provides for gunmetal piston-valve cylinders. Castings for these have been supplied to my own patterns and machined up ready to receive the steam-chest liners. One of your advertisers has supplied two good bronze liners for these parts, and I wrote to another advertiser for a length of $\frac{7}{8}$ in. diameter "Precision Ground Free Cutting Stainless Steel" to make the piston valves—these to be of the plain "bobbin" type, without rings as per "L.B.S.C." in THE MODEL ENGINEER, Vol. 102, No. 2541. My intention is to make the valve-chest liners in two halves, bore to 0.0005 in. under finished size, press into the cylinder castings and finish out to final size with a large "tool makers' reamer" type of broach to be made from $\frac{7}{8}$ in. diameter silver-steel. For this purpose I obtained a 1 ft. length of $\frac{7}{8}$ in. silver steel.

Ordinary *diametric* measurement of both these materials with micrometer revealed no error, but upon testing the materials in vee-blocks with dial gauge for *circular* truth, I was disappointed to find five distinct "waves" in the surface, (which I attribute to the centreless grinding process). Having five "waves" so disposed equally round the circumference prevents detection of the error by measurements of the nominal diameter, although the variation was almost 0.001 in. Clearly the material was no good for the purpose required: the silver-steel was stamped genuine "Stubs quality," and I returned it to the suppliers who did the only thing possible in the circumstances, not having any alternative material to offer, and refunded the purchase price in full, saying that they could not understand the 0.001 in. variation, "as this steel is guaranteed to half this."

Since then, I have been in touch with Messrs. Taylor Stainless Metals of 2, Buckingham Avenue, Slough, Bucks, who appear to be quite forthright about the position and regret that they cannot help in supplying bar of the desired quality. They state that the normal standard tolerance for centreless ground stock bar is + 0.002 in. − 0.002 in. and suggest that I shall have to obtain the required degree of precision by reducing from $\frac{15}{16}$ in. diameter.

This term "Precision Ground Free Cutting Stainless Steel" therefore, is apt to be misleading it would appear, being a relative term only, of course, and I would like to know whether anyone has actually made successful bobbin-type piston-valves of this size from the commercial material without special treatment in the way of lapping and grinding? I appreciate that adequate lubrication with the right type of oil is essential for this job, and I am providing for an efficient mechanical lubricator; but am I being too "fussy" about this material problem? All my previous locomotives, including a 5-in. gauge 2-2-2 single-wheeler, have had flat slide-valves.

Yours faithfully.
Louth. J. R. BURDETT.

STEEL BOILERS

DEAR SIR,—In connection with 5-in. gauge, or larger locomotives, I would say that it is the boiler which deters many builders from completion of the task, and in this connection I am an advocate of the steel boiler, built by arc-welding, with commercial copper water pipe for tubes expanded into carefully reamed tubeplates. Given a light coating of internal scale and then care in blowing down and drying out for storage, this "pitting" bogey just doesn't arise. The cost is a fraction of the copper job, the steaming capacity not noticeably different, and if repairs *should* become necessary, any garage has an oxy-acetylene blow pipe these days! The greater inherent strength of steel renders it only necessary to provide the simplest of stay-bolts and angles and greatly reduces the amount of work necessary to complete a boiler. Small "weeps" (if any, there should be round stay-bolts, etc.) will "take up" without recourse to soft solder.

No sensible person would suggest hat the steel boiler is superior to the copper one in every respect, but personally I have obtained every satisfaction in the use of steel on 5-in. gauge. The "£ s. d. angle" enters into our model engineering activities these days to a very great extent, and there are many who would find the cost of a copper boiler quite prohibitive; yet they would be able to go ahead and produce the larger locomotive with success by using steel.

There does appear to be a certain amount of prejudice against steel, often by those who have never built or operated a boiler of this material; but I would say that the small locomotive builder should be encouraged to experiment in this direction, rather than abandon a model if he is not prepared to build in copper, for one reason or another, always provided that the proper care is taken in testing and maintaining the boiler.

Yours faithfully,

Louth. J. R. BURDETT.

IMITATION MASONRY

DEAR SIR,—Messrs. Kent and Tapper's very logical criticisms, in THE MODEL ENGINEER for October 22nd, of the use of plaster of paris for imitation brickwork interested me considerably.

There are a number of preparations, marketed by the Karlena Art Stone Company Ltd., which would overcome all the shortcomings of plaster of paris which were voiced by Messrs. Kent and Tapper. The two preparations in question go under the trade names of "Amax 109" and "Stonax," the former making the plaster as hard and strong as concrete and the latter being a non-smear synthetic wax finish.

As to fixing the model shown, surely it is simple enough to make miniature rag bolts.

I have only made one base by this method so far but when completed the effect left nothing to be desired, although I cannot recall a more fiddly job than brick-laying with ½th scale bricks. The address of the firm is :—

Karlena Art Stone Co. Ltd., Plastics 2F Division, Karlena House, 270-272, Oxford Road, Manchester 13. And their catalogue covers all aspects of plaster casting.

Yours faithfully,

W. TRAVIS.

SMALL ELECTRIC MOTORS

DEAR SIR,—The article reviewing small electric motor characteristics (December 24th, 1953 issue) is very interesting; it is unfortunate, however, that the details given of the capacitor-start motor are incorrect, as this type is very much used in the home workshop.

The modern capacitor-start motor of the size used for workshop power drive (1/6 h.p. and higher) has a circuit similar to that of Fig. 2 in the article, with the addition of the capacitor and centrifugal switch in series with the W (starting) winding.

Incidentally, split-phase motors of similar size are also fitted with a centrifugal switch, a point not mentioned in the article.

Reversal of either type requires a two-pole two-way switch in the starting winding circuit, as shown in Fig. 2.

Yours faithfully,

St. Albans. D. BECKER.

OUT-OF-SCALE WHEELS

DEAR SIR,—With regard to Mr. Cox's letter in your issue dated December 17th, I, too, have wondered why the *Titfield Thunderbolt* wheel castings were so clumsy, and, unlike Mr. Cox, in place of turning off the outer diameter to reduce the out-of-scale appearance, I am working from the inside of the rim outward, somewhat laboriously, and filing—a very slow process. Reducing the outer diameter appears to be useless, as this upsets the entire appearance of the locomotive, and I am wondering whether Mr. Cox has come up against the rather tight clearances between the motion-plate and the drivers, even as I did, and by reducing their diameter is, in fact, killing two birds with one stone.

My other complaint concerning this design—if complaint it is, is that should the prototype have been followed more exactly with regard to the hornplates and these made double, although extra work would have been thereby entailed, the lining up of the steel horns would have been rendered very much easier, and I am very sorry that I, myself, did not incorporate double hornplates when building the frames.

If I can be of any assistance to Mr. Cox, perhaps he would care to contact me *via* your good selves.

Yours faithfully,

Pinner. R. F. J. POUNDS.

L.B.S.C.'s LOBBY CHAT

(*Continued from page 155*)

to shift the "Cat" pump to the side of her smokebox, and feed it through a superheating coil in the smokebox, with the regulating valve outside; but what with the eternal round of one darn thing after another, the job has never been done. Not that it matters a Continental, because the slowest speed that the pump will run at, on wet steam, is just about right for maintaining the water level with a good load. Same applies to *Fernanda*. When running, I usually set the bypass of the latter engine's eccentric-driven pump, and only use the donkey if she needs water whilst standing. On the "Cat" the injector does the needful. Now you know all about it!

A Mystery Solved

On page 630 of the issue of November 26th last, there appeared a picture showing a *Rainhill* type engine at work, and I said that I didn't know the builder's name. Well, I've just had a letter from that very same person, and am glad to give credit where due. The builder is Mr. Emery Ohlenkamp, of Chicago, and the driver is his son Harold. Our worthy friend says that for several years past, he has taken the engine, with a portable track to the National Threshermen's Reunion, at Alvordton, Ohio, where the ability of such a little engine, to haul living loads, has always created quite a sensation. He attributes the success of the little *Rainhill* to the design and instructions; but they would have been useless without his skill in carrying them out!

The Tale of a 3-Step Pulley

By A.R.R.

THE need of a ¼-in. drilling machine was beginning to be felt shortly after the commencement of one of "L.B.S.C.'s" locomotives (*P. V. Baker*), and it was decided that something had to be done about it before anything else.

To most of us, the home-made article is valued above the commercial product, especially when made at a fraction of the cost (if any at all), and in my particular case, I had safely treasured for such an enterprise, a length of shafting, two discarded clothes airer pulleys and an odd backplate—just asking to be made into a drilling machine. However, the manufacture of the drill is another story.

The part which was making me scratch my head was the driving pulley. I felt that I wanted a 2- or better still, a 3-step pulley. You can get them fairly cheaply! But I have not been able to get one near to the size I wanted.

I had a quantity of aluminium alloy castings which were left over after taking the pickings from some *ex*-R.A.F. instruments. Now I do not know if anyone has attempted to disintegrate such lumps into small enough pieces for the melting pot with the aid of a large hammer; I hadn't! After numerous brutal strokes on a part under operation which leaped dangerously in all directions under each successive blow, I only succeeded in making a few dents.

The common hack-saw, which I have always regarded as a tool to be used as little as possible on account of the energy and patience required (by me, anyhow) to saw any considerable amount, was at last resorted to for the thicker parts of the metal. The remainder was literally torn and prized apart with the aid of the bench vice and an adjustable spanner.

My "melting pot" took the form of a tin, which previously contained fruit, to which was added a wire handle. Our kitchen domestic boiler was always regarded as an efficient means of generating heat ever since I attempted to anneal the end of a length of 1 in. copper pipe. (The end melted off!) Therefore, the next step was to stoke up a small clean fire in the boiler, resting my pot on the fire, adding coke around its sides and turning on full draught.

After what seemed hours, the metal sluggishly and in a rather grudging manner melted, but not until the whole mass was a good red colour. I carefully fished out the tin, which glowed like an Olympic torch, and gingerly poured the contents into my mould, which was another tin approximatlye 3 in. × 2 in. that originally contained peas.

Hardly had I finished this process when the mould disappeared and the molten metal took to its heels! The mould turned out not to be tinned iron as I thought. Fortunately the pouring was done on the boiler-flap and no damage was done.

The following evening the metal was again melted in the same manner (after laboriously cutting it into pieces again) but this time left in the melting pot, which, although a little larger in diameter than the mould that was, would do. It was conveyed carefully at the end of the piece of fishing-out wire across the kitchen and out into the yard.

The glowing mass was a pleasing sight in the evening light. Thoughts of blast furnaces were not far away. I placed the pot on the concrete to cool and admire, when it suddenly struck me that it would not be a bad idea to put it on a piece of asbestos. The small piece I had was duly found and immediately placed under the pot, and once more my admiring stance was taken up a matter of some comfortable inches away. Hardly had this state of affairs been reached when there was a terrific crack resounding around the neighbourhood. The pot jumped —and I leapt back several yards—leaving me in a much less complacent state than a few seconds before.

The pot had jumped as a result of the asbestos exploding, but as luck had it, it stayed upright, with my precious metal still inside.

For the few who wonder at this phenomenon, the heat caused the moisture in the asbestos to generate steam, and the asbestos, being the weaker, had to go. There was a neat piece out of the asbestos where the pot had stood.

To complete: The melting pot, now the mould, was cut and pulled away, leaving a satisfying lump of alloy which turned nicely into my long-awaited 3-step pulley.

OBITUARY

THE Dublin Society of Model and Experimental Engineers has just suffered the loss of its last surviving founder member in the lamented passing of Mr. John Kelly. In 1901, he was one of a small band of enthusiastic pioneers in the Irish capital who, influenced by the success of the Society of Model and Experimental Engineers then recently formed in London, decided to found a similar body in Dublin. Innumerable members have come and gone in the interval, but John Kelly remained a staunch supporter of his society for 53 years.

Mr. Kelly had promised to address the society on February 12th, sketching its history and entertaining his audience with lantern slides depicting its earlier activities. But the last call was at hand, and the grand old gentleman of four score years could not but hear, and answer it. All those who were privileged to know him will be the poorer for his passing, for he was truly the Grand Old Man of Model Engineering in Dublin.

In particular, he will be sadly missed during the society's summer session at Herbert Park, Ballsbridge,

where, whether at the pond-side or the track, nobody who saw John Kelly, hemmed in as he usually was by a throng of admirers of tender years, could but call to mind Hans Christian Andersen. He had a vast mechanical and scientific knowledge which was gladly placed at the disposal of all who sought it. May his guiding spirit live on amongst those who mourn his death.

QUERIES AND REPLIES

" THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked " Query " and be addressed to THE MODEL ENGINEER, 19-20 Noel Street, London, W.1.

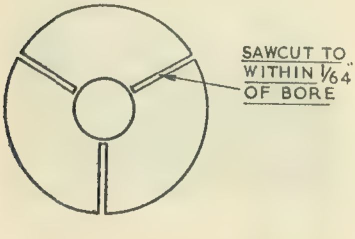
Hardening Collets

I have just made a set of lathe collets from K.E.809 steel, which I intend to harden and temper, and grind in the bores. On attempting to harden the first one, I find that the material has distorted, and that some of the segments of the collet have wandered out of place. Is there any means of preventing this, as the collets would be useless in this condition?

D.H.T. (Swindon).

The distortion you mention is almost bound to take place if collets are hardened in an open flame in the ordinary way, and precautions should really have been taken during the manufacturing process. However, as you have now made the collets the following steps may be taken.

First turn a tightly fitting mild-steel plug to fit the bore of each of the collets which we presume are now undersize. Now turn a mild-steel sleeve to be a tight fit over the outside shank of the collets. Hardening and quenching is done with the plugs inserted in the collets, which are pushed into the sleeve. The whole assembly should be heated and plunged together.



For the tempering process, the plugs should be again inserted into the bores, but the sleeve replaced by a binding of soft steel wire, around the nose end of the collet. Tempering should be done in a sand bath, which helps to secure even heating. The collet should be embedded in a tray of fine sand, and the whole gradually heated over a gas ring.

An approved method of manufacturing collets, which minimises the risk of distortion, is shown in our sketch. This drawing shows the end view of a collet after the saw cuts have been made, and it will be noted that the cuts have not been allowed to break into the bore. A thin wall of about 1/64 in. thickness should be left. After hardening and tempering, this thin wall is broken out, using a thin slip of steel and a light hammer. The collet bores are then usually ground, although we have successfully made unground collets by this method.

Locomotive Starting

In order to settle an argument, would you please explain why, if a steam locomotive refuses to start when the regulator is opened, the driver reverses the engine and opens the cylinder draincocks? It is the latter which particularly puzzles my friends and I.

V.P.T. (Luton).

The reason why a locomotive will sometimes refuse to start at the first attempt may be, either that steam is entering one cylinder only and there is not enough tractive power to overcome the static resistance of the train, or the steam is somehow getting into two cylinders at once, while the crank is in such a position that the pressure on one piston is opposing that on the other. In either case, the driver opens the draincocks in order to release the steam imprisoned in the cylinders; he reverses the engine and opens the regulator to let steam into the cylinders again, but on the other side of the pistons. The engine is almost certain to move, but in the direction opposite to that intended; this has the effect of altering the positions of the valves, and the chances are that when the driver once more reverses the engine and opens the regulator, the engine will move in the required direction and, this time, start the train. The driver will now close the draincocks, unless he suspects the presence of any water in the cylinders.

Running a New Engine

I have just finished (except for painting) a 3½-in. gauge model of a G.W.R. 2-4-0 " Metro " type tank engine, but on its first steam trial it gave a very disappointing performance. The boiler steams well, but the engine lacks power and speed. Could you say what is wrong?

V.B. (London, S.W.).

There could be several reasons for the poor performance of the engine, but since you do not mention any specific signs of trouble, apart from the lack of power and speed, we suspect that the main cause, at this stage, is the stiffness due to the newness of the working parts. The cure is to run the engine frequently and for as long as possible each time, preferably under steam, though compressed air is almost as suitable, if you have a supply available. You have probably been a little too optimistic in expecting perfect running at the first trial, and we think there will be considerable improvement after a few spells of " running-in." If there is no better running after, say ten or a dozen trials, write to us again, giving details of any noticeable defects in the performance, and we will try to give you some definite advice.

G.W.R. 2-8-0 Loco. for 3½-in. Gauge

I have made drawings for a 3½-in. gauge 2-8-0 locomotive of the G.W.R. " 4700 " class and wish to start the building of it, but I have not been able to find any advertisement of suitable castings, and would be obliged if you could make any suggestions. Also, how many of the full-size engines are there, and what trains do they work?

S.K. (London, W.9).

We suggest that the castings supplied for the 3½-in gauge " Purley Grange " by " L.B.S.C." would meet your needs; the cylinders and wheels of the " Granges " are the same as for the " 4700 " class. The castings are obtainable from either Kennion Bros. (Hertford) Ltd., or Dick Simmonds & Co., of Erith. There are nine of the full-size engines numbered 4700 to 4708 inclusive. They are normally used for working express freight trains of braked stock to the West of England, Wolverhampton, etc. In the summer months, they are often to be seen working relief express passenger trains and, very occasionally, heavy ordinary freight trains.

5-in. Gauge Loco Boiler

I am contemplating building a working scale model of a London and North Western Railway 0-6-2 " *Coal* " *tank engine for 5-in. gauge, but the drawing shows that the boiler will be very small if made to scale externally. I would be very grateful if you could let me have your opinion, and possible recommendations before I start construction, bearing in mind that I do not wish to spoil the look of the engine in any way.*

T.C.F. (London, N.W.).

You need not be unduly worried about the small size of the boiler, since the overall sizes of a boiler are not of paramount importance, within limits. The outside diameter of the barrel, in your case, would be about 4½ in. and the length between tubeplates about 11 in. We know of other 5-in. gauge locomotives of which the boilers are of exactly these dimensions, and there is no difficulty in the supply of steam. With these in mind, we suggest that your boiler should have twenty 7/16-in. tubes, which can be fitted in without requiring the firebox crown to be more than 7/16 in. above the boiler centre-line. There will be no room for a superheater unless you recess the smokebox into the barrel about ½ in., so that the header can clear the blastpipe without disturbing the position of the centre-line of the chimney.

We recommend a horizontal grate, not less than 4½ in. below the boiler centre-line. If you make this boiler from copper, the thickness of the barrel tubing should be 3/32 in.; the tubeplates should be ⅛ in. thick, and the firebox material should be 3/32 in. thick. The barrel and the outside wrapper of the firebox should be lagged so that the outside diameter of the boiler is not more than 4¾ in.

Films

Our society is shortly organising a " *Film Night,*" *and in order to present as varied a show as possible could you let me know of any source of supply of films that we could obtain, other than the C.O.I., the various petroleum companies and the Royal Aeronautical Society.*

H.A.S. (Newport).

Apart from the people you already mention, the others we know are:—

(1) The Public Relations and Publicity Officer,
British Railways (Midland Region),
Room 400,
Euston House,
London, N.W.1.

(2) Normans Film Service,
58, Wardour Street,
London, W.1.

(3) Educational Productions Ltd.,
17, Denbigh Street,
London, S.W.1.

Steam Whistles

Can you please inform me of anyone from whom it is possible to obtain fully detailed drawings of a steam whistle. I do not wish to construct a scale model whistle, but one of full size to be powered by compressed air at approximately 100-150 *lb. per square inch.*

J.W.P. (Upton-on-Severn).

We suggest that you apply to the Public Relations and Publicity Officer, British Railways, Room 400, Euston House, London, N.W.1, who might be able to help you.

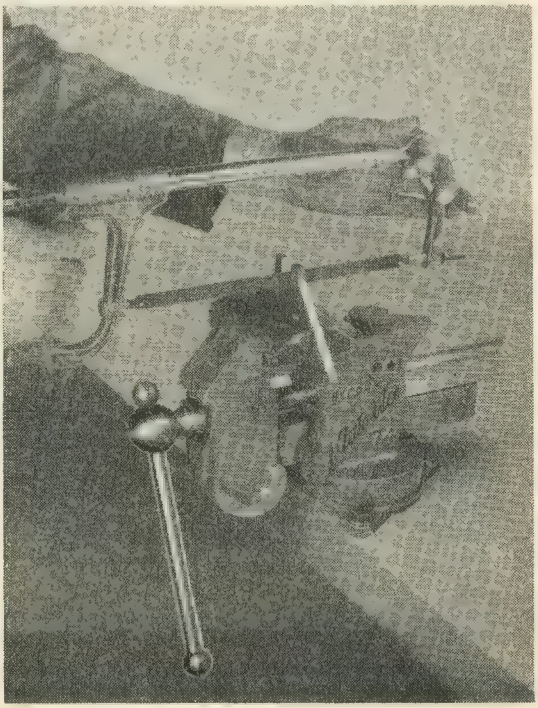
THE "RECORD" AUTO VICE

THE well-known " Record " tools for engineering and allied crafts include a wide range of vices in types and sizes to suit all classes of work. We have recently carried out prolonged working tests on the " Record " auto-vice No. 74, and find that it is not only of very sound construction and design, but also of unusual versatility, being adaptable to many purposes outside the scope of the orthodox type of vice.

This particular vice has jaws 4 in. wide, with the usual serrated hardened steel inserts, and the guiding member of the front jaw is a steel bar of deep rectangular section. The vice screw, immediately above this, has a long bearing, with provision for lubrication, and is provided with a channel-shaped swarf guard at the back of the fixed jaw. An ingenious form of swivel mounting for the vice is incorporated, with a soleplate adapted to bolt securely to the bench, and having a central hole to take a bolt in the base of the vice itself; this passes through the bench, and is secured by a hand-nut with a large thrust washer. Serrated radial tracks on the baseplate and underside of the vice enable the latter to be locked firmly at any angle, with moderate tightening of the hand-nut.

A removable anvil pad is fitted to the vice immediately above the centre of support, and a semicircular projection cast on the lower part of the front jaw enables it to be used for bending pipes or solid bars. On the inner side of the front jaw is a rectangular slot to take an extra vee-grooved jaw, which in conjunction with a permanent vee-notch in the rear jaw, serves as a horizontal pipe vice. Included in the fittings of the vice are a pair of fibre-faced jaws, and a hexagonal component screwed each end to suit English and American sparking-plug threads, which can be used to facilitate holding cylinder-heads in the vice.

" Record " products are manufactured by Messrs. C. & J. Hampton Ltd., Record Works, Sheffield, and obtainable from all tool dealers.



WITH THE CLUBS

The Oldham S.M.E.

The society had a successful year in 1953. Activities included visits to Wallasey and Brighouse clubs' "open days," a successful exhibition and our own "open day."

Planned activities for 1954 include the following :—

Fri., Feb. 12th, meeting, lecturer, Mr. H. Baron; Fri., Feb. 26th, visit to printers of the "Oldham Chronicle"; Tues., March 9th, visit to Manchester School of Signalling of the British Railways; Fri., March 12th, meeting, lecturer, Mr. G. Ogden; Fri., March 26th, meeting, lecturer, Mr. G. Jones; Fri., April 9th, meeting, lecturer, Mr. W. Ogden; Friday, April 23rd, meeting, lecturer, Mr. H. Griffiths; Fri., May 14th, meeting, lecturer, Mr. A. Raynor.

In addition, visits to a power station and a gas works, and at least one film show are in preparation.

Meetings are held at King St. Co-op Buildings, Oldham, and an invitation to join our activities is extended to all model engineers, but as the size of parties for visits is limited, we would like plenty of warning of intention to join us.

Hon. Secretary: J. Yardley, 47, Marlborough Street, Oldham.

City of Leeds S.M.E.E.

At the a.g.m. of the above society the treasurer's report showed that we had enjoyed another financially successful year. Our president, Mr. Cook, was with us again after a long absence through illness and in his address he commented on the need for more members who would be able and willing to take on responsibility. The portable track, he was pleased to note, had contributed substantially to our finances, and he looked forward to an interesting and successful exhibition in the near future. Tribute was paid to retiring officers and especially to Mr. Colbran who, after having served the society most efficiently as hon. sec. for a number of years had found it necessary not to seek re-election.

"Mutual fellowship" was the theme of the chairman's address. He said the aim of the society should be to enrol more members of the right type and to try to promote a feeling of goodwill towards neighbouring societies.

Future meetings at Salem Institute, Hunslet Lane, Leeds, at 7.15 p.m.:

Tues., March 2nd. Tool and gadget competition night.

Tues., March 16th. Locomotive performance—talk by Professor Tuplin, of Sheffield

Anyone interested in model engineering, either actively or otherwise, are welcome at all meetings.

Hon. Secretary: E. Mann, 162, Town Street, Armley, Leeds, 12.

Southern Federation of Model Engineers

At the annual general meeting of the federation, held at Southampton, on January 9th, Mr. Wicks, of the Andover Society, was elected chairman for the ensuing year. Mr. A. E. Smith, of Gosport, becomes vice-chairman, and Mr. R. A. Read continues as hon. secretary and treasurer. The accounts, showing a satisfactory balance in hand, were passed.

The Cheltenham and Trowbridge societies have joined the federation, and it was suggested that the federation might be extended to include model making societies of all kinds. It was decided that support should be given to any proposal which might be put forward for a national federation of M.E. societies.

Societies in Southern England who would like to join the federation, which offers a convenient means of mutual assistance and co-operation and the promotion of the model engineering movement at low cost, should communicate with the Hon. Secretary: R. A. Read, 90, Woodside Road, Salisbury, Wilts.

CONDITIONS OF SALE

This periodical is sold subject to the following conditions, namely, that it shall not, without the written permission of the publishers first given, be lent, resold, hired-out or otherwise disposed of by way of trade except at the full retail price of 9d., and that it shall not be lent, resold, hired-out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of trade; or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

CORRESPONDENCE

The Managing Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Correspondence and manuscripts should not be addressed to individuals, but to the Managing Editor, The Model Engineer, 19-20, Noel Street, London, W.1.

SUBSCRIPTION RATE

The Annual Subscription is £2 2s. 0d. post free, to all parts of the world.

Private: 3d. per word. Trade: 6d. per word. Minimum 12 words. Use of box 1s. 0d. extra.

THE MODEL ENGINEER

Rates for displayed advertising in this section 35s. per single column inch 1⅝ inch wide.

CLASSIFIED ADVERTISEMENTS

WORKSHOP EQUIPMENT

Buck and Ryan for Lathes and Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661. Open 8.30 a.m.-5.0 p.m. Saturday 1.0 p.m.

"Impetus" machines, wood planers, motorised drills, belt sanders, electric motors, paint sprays, air compressors, circular saws, etc. Catalogue.—JOHN STEEL, Castlefields, Bingley.

New (Slightly Soiled), 2½"-3-jaw reversible scroll chucks (Model 32, Burnerd) reduced from £5 8s. to £3 10s. (1s. 9d. p. & p.) 8 mm. split collets 0.8 mm. to 3.0 mm., reduced from 8s. 6d. to 6s.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, E.C.1.

"M.L.7" Motorised 1/3 h.p. chucks, faceplates, etc., 14" cross slide, front and rear indexing toolposts, two vertical slides collet chuck, tools, milling cutters, ¼" drill, 4½" grinder. Delivered free England and Wales. Offers nearest £70.—Box No. 7170, MODEL ENGINEER Offices.

Rebuilt Lathes. The Acorn Machine Tool Co. (1936) Ltd., offer rebuild to limits "Acorntools" and "Atlas" 10" swing s.s. and s.g. lathes. Hire purchase terms are available. Write—610-614, Chiswick High Road, W.4. (Phone: CHI 3416).

Hobson All-Geared Head Lathes, 3½" × 18" between centres from £53; Eagle surface grinders, 20" table, motorised, 1 h.p., £120 and £140. New vertical milling machines, 18" table from £120; bench milling machines, 12" × 4" motorised from £90. H.P. facilities.—VICTA ENGINEERING COMPANY, Maidenhead.

The Acorn Machine Tool Co. (1936) Ltd., are in a position to undertake the complete rebuilding of Atlas, Acorntools, Sphere and Halifax lathes, or, if preferred, we can supply any spare parts that may be required for these machines. Full range of accessories and equipment for all these machines also available. Generous allowance given on old machines against the supply to new "Acorntool" lathes. Second-hand machines, of Atlas and Acorntools manufacture, rebuilt by us available from £75 each. Write to—610-614, Chiswick High Road, W.4. Tel.: Chiswick 3416-7-8-9.

Tool Bargains. Lathe tools, high speed ⅜" square, 40s. set of 12. ½" square 65s. set of 12. P.P. 2s. High speed drills, 1 doz. up to ⅜", 12s. 6d. P. 6d. Surface gauge by "Eclipse," hardened base, list 59s., our price 48s. 6d., p. 9d., send 6d. for full list.—MIBRO EQUIPMENTS, 65, Knaresborough Road, Harrogate.

Handy Utility electric drill and stand, Model No. 1. As new, approval, deposit, £6 10s.—40, York Road, Haxby, York.

Brand New Myford "M.L.7" lathe for sale. Maker's wrapping. Best offer above £35.—Box No. 7160, MODEL ENGINEER Offices.

3½" Grayson Lathe, 4-jaw chuck, faceplate, centres, change wheels, drill chuck, countershaft, ¼ h.p. a.c. motor, excellent condition.—FRENCH, 102, Hindes Road, Harrow, Middx.

Plain Lathe 3½" chuck faceplate countershaft motor, tools, 22" centres, £15. Horizontal miller 18" × 6", table rack feeds, cast-iron base, £23. Both excellent condition.—BROWN, 73, Brown's Lane, Allesley, Coventry

For Immediate Delivery of
Tools & Machinery
Phone Shoreditch 8301
S. TYZACK & SON LTD. 341/5 OLD STREET, LONDON, E.C.1

The 2½" × 10" "E.W." Lathe. Unrivalled in its class. Plain lathe £13 4s. Fully convertible to back gear and screwcutting. Can be obtained on the easiest of terms from 5s. weekly. Send s.a.e. for details. Adept lathes, shapers. Britinol blow lamps. No interest, no fuss credit terms. Details s.a.e. —WANSTEAD SUPPLY CO., 48, High Street, London, E.11.

Countershaft With Striker ¾" flat pulleys, Portass, £3. Micrometer, 1", new, £2. J. & S. 5/16" tool holder, 10s. ¼ h.p. induction motor, £3 15s. Set of Myford H.S. Tools, £2 15s.—BENNETT, "Merriecroft," The Common, Cranbrook.

Drummond 3½" Lathe, maker's stand, treadle, ¼ h.p. 230 a.c. motor, overhead cantilever milling drive, seen working, £25.—Box No. 7167, MODEL ENGINEER Offices.

Zyto 3⅜" B.G.S.C. Lathe, 4" 3-jaw and 4" 4-jaw chucks and ½" drill chuck. New December, 1952. Seen week-ends or evenings. What offers?—A. J. BUMSTEAD, 44, Leigh Road, Hildenborough, Tonbridge, Kent.

Circular Milling Table Castings, drawings, 4" diam., 2" high, 25s. C.W.O. Enquiries s.a.e.—COUPE, Kirklevington, Yarm, Yorks.

Quantity of New High Speed side and face milling cutters, 3½" dia., 1" holes, ¼", 5/16", ⅜", 7/16", ½", ⅝", ¾" thick, B.S.A., Firth, etc., 15s. each. Post 1s.—G. ATTFIELD 1, Thornsett Road, London, S.W.18.

For Sale. Myford "M.L.7." motorised on strong wood bench, accessories, chucks, tools. Also drilling machine, nilling attachment, etc., enquire—MORRIS, 3, Belmont Road, Torquay.

For Sale. 5" Atlas lathes, s.s. & s.c., long bed, £40 each.—G. H. CHAPPELL SONS & CO. (METAL MERCHANTS) LTD., 586, Lea Bridge Road, Leyton, E.10.

ALUMINIUM TUBE
(Suitable for TV Aerials)
⅜" o.d. x 20-g. **7d.** ft.; ½" x 20-g., **8d.** ft.
Alum. Rod, 5/32" dia., **3d.** ft., 0.210" dia., **5d.** ft., ¼" dia., **6d.** ft.
Alum. Sheet. 14¼" x 3¼", 19-g.; **6/-** doz., 11½" x 3" x 19-g., **4/-** doz., 18¾" x 4" x 20-g., **10/-** doz.; 9¾" x 5" x 12-g and 9" x 8" x 18-g., **1/-** each; 14" x 8½" x 18-g., **1/6** each.
Send **6d.** for 24-page catalogue. Post **1/3** under **£2.** Over free.
Visit our shop. Open all Saturday.
Tel.: St. Albans 5951
BOLD & BURROWS
12/18, Verulam Road (A5), St. Albans, Herts.

"Atlas" 5" Lathe, motorised, 200V single-phase, roller-head, 4½" chuck, good condition, seen working, £62. Apply after 6 p.m. or write for appointment.—BUSKELL, 10, Linchmere Road, Lee, S.E.12.

H.A.E. 4½" × 28" Screwcutting Lathe, vee bed and stand, £25.—42, Eastway, Morden, Surrey.

Wanted. Bench drill. Interested workshop equipment.—BRIERLEY, 211, Halifax Road, Rochdale.

Motorised Lathes. Denham 5" A.G.H., £100; Holbrook 6", £65; Monarch 7", £80; belt driven 6" and 7" lathes, £25; Churchill 12" × 36" Universal grinder, £135; Garvin 6' × 2' piano miller, £65; 3' 6" planer, £75; Ward 1½" capstan.—167B, Angel Road, N.18. EDMonton 3685.

Zyto 3⅜" B.G.S.C. Lathe, countershaft, stand, access, perfect condition, £24. Wood-turning lathe, circular saw, ½ h.p. motor, stand access., £9.—MARSDEN, 2, Parker's Court, Green Road, Leeds, 9.

Lathe. Drummond 3½" self-acting lathe, with ½ h.p. electric motor (with gears enclosed). Variety of attachments, £35. Apply—P. CORNWALL-JONES, Orchard House, Waltham St. Lawrence, Berks., Tel. Shurlock Row 232.

Myford "M.L.7" 3½" Lathe, motor, s.c. and independent, tailstock chucks, std. accessories, tools, various attachments, reversing switch, £49. Fobco "Star" ½" bench drill, 4-speed with 1/3 h.p. motor and machine vice, £26. "Selecta" 6" double end bench grinder, 1/3 h.p., £10. Drawings, materials and castings for "Tich," £5. Quantity other material, workshop sundries. Drills, 1-60, £2. 16 mm. Kodascope "EE" Projector, 300 W lamp, Resce, case, splicer, film, £15. Back numbers "Model Engineer," and "Aeromodeller." Books, offers. Buyer collects. Seen—11, Glynwood Gardens, Sheriff Hill, Gateshead, 9.

2½" Boley Lathe, motorised, complete chucks, vertical slide, milling spindle, £20. Two oxy-coal gas brazing lamps and oxygen gauge, £3. Various compressors, tubular heaters, etc.—CROSS, 31, Croft Avenue, West Wickham, Kent.

New "Besco" 26" closed end cramp bench folding machine, £13 10s. New "Besco" 16" × 1" lightning binding rollers, £8 10s. New "Ben" model P3 portable Spray painting unit, ½ h.p. motor, 230 V-1-50, £30. As new "Grafton" ½" capacity drilling machine, ½ h.p., 230 V-1-50 motor, £30. "Besco" 24" treadle guillotine, excellent condition, £20. Offers considered for above.—Box No. 7176, MODEL ENGINEER Offices.

For Sale, Complete Workshop, with 8 × 6 shed, wood floor, lathe, tools, locos., radio gear, Viemas chassis. "M.E.s" from 1946, "Wireless Worlds" from 1944. Books, radio, engineering, loco, bench, cupboards, £250 worth. Offer for lot. S.A.E. list. Must sell! Emigrating.—G. L. PENROSE, 145, Malmstone Ave., Merstham, Surrey.

Selling Workshop. Machinery, Stainless steel, rod, sheet, gears, ballraces, a.c. motors, transformers, electrical gear, tools, air drills, compressors. Please state wants. S.A.E. Callers welcome.—GAMMON, 16, Banning St., Greenwich. Tel.: GRE 5324.

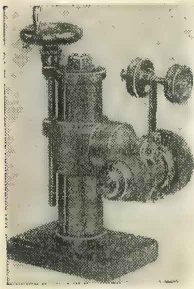
Holtzappfel Lathe and ornamental turning equipment, good condition, very complete. £175 o.n.o. Also 5½" B.G.S.C. treadle lathe by Pfiel & Co., £20, o.n.o.—KELLY, 36, Hill Rise, Cuffley, Herts.

MODELS AND FITTINGS

Complete Parts Boiler. $\frac{1}{8}$ copper, "Maid of Kent," $\frac{3}{8}$" flanges, close riveting, £4. Boiler parts for $\frac{3}{4}$" scale, also. Giving up, illness and old age. Professional work—S.A.E. —Box No. 7158, MODEL ENGINEER Offices.

Stocks of Locomotives from $2\frac{1}{2}$"-$10\frac{1}{4}$" gauge.—MINIATURE TRANSPORTATION LTD., 2, The Arcade, Liverpool Street (Met.) Station, E.C.2.

Masserati 2.5 c.c. scale racing car, real wire wheels and spare tyres, £16, radio control transmitter and receiver, £7. Car racing spares, engine, clutches, etc. Write for list.—BENNETT, "Merriecroft," The Common, Cranbrook.



Universal Milling Attachment
for 3" to 4" lathes
Castings 38/6
Finished £16 10 0
post free
Lists 6d.
G. P. Potts
Ruthin Road,
Denbigh

$3\frac{1}{2}$" Locomotive and Tender. As new, unpainted, for immediate sale. "Iris," by L.B.S.C., £30 or nearest offer. Details from—Box No. 7165, MODEL ENGINEER Offices.

5 c.c. Petrol Engine. Fully machined parts ready to assemble, remainder of well-known maker's stock, 45s. 6d. Flywheels, 7s., plugs 2s., coil, condenser 9s. 6d. Model car parts list 3d.—J. W. BAGNALL, Model Craftsmen's Supplies, South Walls Road, Stafford. Tel. 420. Est. 1936.

$1\frac{1}{2}$" Scale 2-6-4 tank locomotive, nearing completion, really first-class workmanship. Particulars s.a.e.—Box No. 7166, MODEL ENGINEER Offices.

Wanted. Horizontal mill engine not less than 2" bore, heavy flywheel and build. First-class workmanship, materials and condition essential. Approval. Full details please.—Box 7168, MODEL ENGINEER Offices.

Wanted. "L.B.S.C." passenger car, $3\frac{1}{2}$ g., or other type, 8-wheel bogie, with brakes, in good order.—J. TAYLOR, 10, Bainton Grove, nr. Beverley E. Yorks.

Quick Steaming Vertical $\frac{1}{16}$" Steel Copper water tube surrounded boiler, asbestos packed fittings, Pemberthy injector, 180 lb. sq. in. water test, seen, enclosed in steel casing, 42" × 16", photo., £12. Engineer made 4" × 7" cyl. beam engine, "A" pattern frames, fluted connecting rod, ribbed beam, gib cotter adjustments, 24" flywheel, length 3' 6", height same, seen working, photo, £12. Both the above must be collected by the buyer. Partly completed 2" scale compound traction engine, cyls. $1\frac{1}{4}$" and $1\frac{3}{4}$", stroke $1\frac{3}{4}$", professionally made, $\frac{1}{8}$" copper brazed 5" barrel boiler, seen under 200 lb. water test, balanced crankshaft, connecting rods, eccentrics, cyl. block nearly assembled, complete set of gears, rear wheel rims and angles, $\frac{1}{16}$" sheet copper to make tender, £45, photo, inspection appointment only.—DEWHURST, Riverside House, Reedham, nr. Norwich.

"Netta." Materials and castings when described for Gauge "O"-"1" will be stocked by—LUKEN'S-O-B'HAM, 10, Coldbath Road, Birmingham, 14.

Collector Wishes to Sell several $2\frac{1}{2}$" and $3\frac{1}{2}$" locos., traction engines, unique stationary engines, beam engines, boilers, trams, etc.—Box No. 7175, MODEL ENGINEER Offices.

For Sale. £40. "Hielan' Lassie," going on completion. All turning finished. Also three cylinders. With all castings.—MR. LESLIE CHEEL, 85, Leyes Road, Custom House, E.16.

Wanted 5" or $7\frac{1}{4}$" Gauge Loco, also large model traction engine in any condition. Cash or exchange car.—C. ARNOLD, 8, Homestead Way, Northampton. Tel.: 31001.

25 "O" Gauge 4-4-0 Locos and tenders in advanced stage construction. Offers invited. for lot. Specimen sent against deposit.—Box No. 7172 MODEL ENGINEER Offices.

For Sale. Gauge "O" "Mollyette" loco., steam, perfect condition, £3 10s., o.n.o. —BALCHIN, 44, Victoria Road, Knaphill, Woking, Surrey.

Dyak $2\frac{1}{2}$" Loco and Tender, well finished green and black stoved enamel. Baker gear, injector, mech. lubricator. New condition, running order, unmarked, perfect. Seen by appointment.—P. F. MANDER, 73, High Street, Albrighton, nr. Wolverhampton. Tel.: Albrighton 245 or Wolverhampton 20601.

ELECTRICAL

We Can Supply New & Reconditioned motors and special plant. Our repair department services all types of motors, generators, alternators, $\frac{1}{4}$ to 100 h.p. First class work at competitive prices and quick delivery.—PHILLIPS & SONS ELECTRICAL LTD., 40-42, Waterford Road, London, S.W.6. (Tel.: RENown 1363/4).

A.C. Motors. Special Offer. BTH Delco, etc., 200/250 volt, 1 phase, 30 cycles, 1,425 r.p.m. Capacitor induction, $\frac{1}{4}$ h.p. £4 2s. 6d.; 1/3 h.p., £5 7s. 6d.; $\frac{1}{2}$ h.p. repulsion or capacitor induction, £7 7s. 6d. All motors perfect and guaranteed.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.11. Reliance 1412/3.

House Service Meters. 200-240 V., a.c. (or d.c.). Credit or pre-payment type.—UNIVERSAL ELECTRIC CO., 221, City Road, London, E.C.1.

Dynamos. D.C. 14/32 V, 9 A. shunt wound for lighting and charging, 2,000/2,500 r.p.m., as new, 70s. carriage 5s.—LESLIE DIXON & CO., 214, Queenstown Road, Battersea, S.W.8.

For Motors that Last! 100s of a.c. and d.c. fractionals for every supply and dozens of others up to 50 h.p. Switchgear Converters. Purchases. Exchanges.—VERNON SMITH LTD., 364/366, King Street, W.6. Riv. 3964.

Master Speedranger Motor, Infinitely variable gearbox, $\frac{1}{2}$ h.p., 230 V. Constant torque output 7.5 inch pounds. Output speeds 150 to 2,200, £25, or exchange for lathe.—COX, 22, Mill Road, Bromborough, Cheshire.

A.C. Motors, new 1954, Metrovick/B.T.H., $\frac{1}{4}$ h.p., 200/250 V, 50 cycles, 1 phase, 1,425 r.p.m. Capacitor start, list price £7 15s. 3d. Others up to 1 h.p.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, London, S.E.11. Reliance 1412/3.

Three 1/3 h.p. 400 V 3-phase, 1,450 r.p.m. Motors, as new, £5 10s. each; one $\frac{1}{2}$ h.p., 400 V, 3-phase, 2,800 r.p.m. motor, second-hand, £4 10s.—KENNETH JOHNSON LTD., 28, Bird Street, Lichfield.

12 V D.C. Shunt Wound Motors, 9 pole $2\frac{1}{4}$" × $1\frac{5}{8}$" × $1\frac{7}{8}$", 9/18 W, 9s. 6d., including postage.—CUTLER, Crouch Park, Pooles Lane, Hullbridge, Essex.

Two 3-Phase A.C. Motors, 400/440 V, 50 cycles, 945 revs., 1 h.p., Crompton Parkinson, 2 h.p. English Electric, perfect condition. Offers?—B. A. GRAYSTONE, Manor House, Overthorpe, Banbury.

SITUATIONS

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

Young Men Wanted with experience on small lathes, and bench work, similar to model making, for instrument department, South Birmingham Works.—Box No. 7177, MODEL ENGINEER Offices

GENERAL

Watch and Clock Lathes, cleaning machines, staking tools, etc. (Easy payment terms arranged for purchases of £10 or over). Large illustrated catalogue, 1s. 6d. p.p. Price list 1s. p.p. Materials and repairs for the trade.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, London, E.C.1.

Telescopes—Design and Construction. 3s. p.p. Outstanding American book.—A.P.S.(E)., Sedgeford, Norfolk.

Compressors for Sale. Twin pistons complete with air receiver driving wheel, and motor cradle, 180 lb., $2\frac{1}{4}$ cu. ft., price £3. Also 8 cu. ft. compressor only, £5. Motors, a.c. and d.c., all types, $\frac{1}{8}$ h.p., £3. Carriage forward.—WHEELHOUSE, 1, The Grove, Isleworth, Middx. Phone: Hounslow 7558.

"Spraying Handbook" 1950 ed. Car, caravan, industrial, domestic, stoving, flock leather spraying,—3s. 6d., post free.—LEONARD BROOKS, 23 Harold Wood, Romford.

TV Without Mains, AC/DC self-starting "Chorehorse" generator. As supplied to B.B.C. A.C. mains voltage: 250/300 W., A.V.C. D.C. output available for lighting, will also run small tools, etc., £47 10s., plus 10s. delivery.—Below.

Storage Batteries, approx. one-third list. 12 V, 75 AH heavy duty, 19 plates, separate cells in hardwood cases, finest possible specification, £7 17s. 6d., delivery 9s. 6d. 12 V., 22 AH, almost similar specification, surprisingly powerful £3 12s. 6d., delivery 7s. 6d.; 6 A, 150 AH extra heavy duty, 25 plates, separate cells in hardwood crates, £6 17s. 6d., delivery 8s. 6d.; 6 V, 90 AH 15 plates, hard rubber cells, also suitable for cars, tractors, lorries, etc., £3 7s. 6d., delivery 7s. 6d.—Below.

Chargers 10 amp., 12/24 or 24 V. Heavy duty selenium rectifiers. Input 220/250 V., a.c., fullest adjustments on both sides, £12 7s. 6d., delivery 10s.—Below.

D.C. Motors, Fans, etc., Mains voltage $\frac{1}{4}$ h.p. to 10 h.p. Approx. 75 per cent. below list.—Below.

Dynamos 24 V., 50 A., £3 10s., delivery 7s. 6d. Also cut-outs, volt ammeters, pulleys, etc.—Below.

Air Compressors. Hymatic single cylinder two-stage $2\frac{1}{2}$ cu. ft. 800 lb., £5 17s. 6d., delivery 3s. 6d. Reavell or Broom & Wade 100 lb., 32 cu. ft. or 400 lb., 12 cu. ft., both £27 10s., delivery 20s. Complete mobile compressor plants from £69 10s. to £85 at works. Air storage tanks from £1 2s. 6d., and other air accessories.—TEDDINGTON ENGINEERING CO. LTD., Dept. "C," High St., Teddington, Middx.

C. J. EMMS LTD.
Selenium F/W bridged rectifiers

6-12 volt, 1 amp ...	5/6
6-12 volt, 3 amp ...	12/6
6-12 volt, 4 amp ...	15/-
6-12 volt, 7 amp ...	22/6
24 volt, 1 amp	11/-
24 volt, 3 amp	25/-
24 volt, 4 amp	30/-

26a, COLEHERNE MEWS, S.W.10
Tel.: Freemantle 8941

"Congreve," "Eureka," "Mystery" clocks, etc., required by private collector. —Box No. 7154, MODEL ENGINEER Offices.

Springs. Compression, torsion, tension, designed or to specification.—JAMES M. SIBTHORP LTD., 100, Cecil Street, Watford. Phone: 5388.

Light Engineering to Pattern or drawing, 5" lathes, etc. available.—CLARK, 67, Arkley Road, London, E.17.

"Model Engineers" from January 5th, 1939 to December 25th, 1953, for sale, 12 missing. Any offers?—S. J. BURROWS, High Street, Bagshot, Surrey.

For Sale. 60 c.c. 2-stroke engine, new, complete with condenser, coil, silencer, £8 o.n.o.—MORTIMER, 36, Priesthill Road, Glasgow. Phone: Barrhead 2219.

Wanted. Anastigmat lens, old type in shutter, $6\frac{1}{2}$-8" (18-21 cm.) focus.—DARNELL 58, Station Avenue, Walton-on-Thames.

Build Your Own Refrigerator, all components available at reasonable prices. Frigidaire, "Flowing Cold," units, £5. small single-cylinder units, Kelvinator, etc., £4 ; ¼ h.p. heavy duty motors, £3 ; Chrome cabinet fitting, new, £1 set. Money back guarantee. S.A.E. for lists and schematic diagram.—WHEELHOUSE, 1, The Grove, Isleworth, Middx. Hounslow 7558.

Compressor Equipment, miscellaneous items, etc. Catalogue, 1½d.—PRYCE, 157, Malden Road, Cheam.

Capacity Available. 5" lathe, fitting, and turning one off or quantity. First-class work guaranteed.—R. VARNEY, 55, Minet Road, Brixton, S.W.9.

Lack Concentration for that Special Job? "Concentabs" assist clear thinking. Trial size, 2s.6d., plus postage 3d.—LAMBERT, Chemist, Oakworth Road, Keighley.

Patternmaking. Supply of castings, general model work.—PATTERN & TOOL SERVICES, 2, Harboro Road, Sale, Manchester.

Stainless Steel Sheets, bars and blanks cut to size.—JOHN CASHMORE LTD., Great Bridge, Tipton, Staffs.

Plywood, Hardboard, Blockboard, Hard Woods and Soft Woods. List 1½d. stamp. Veneered plywood, oak, mahogany and walnut, etc.—SPIERS, 330, Hackney Road, London, E.2. Phone: Shoreditch 8791-2-3.

Refrigeration for the Model Engineer. Genuine guaranteed domestic components, Silent and compressor units. All fittings, etc., drawings and castings for L. C. Sherrell's domestic refrigerator. S.A.E. for 16-page hints and list.—BRAID BROS., 50, Birchwood Avenue, Hackbridge, Surrey. Phone: Wellington 9309.

"M.L.7" Little Used, motor 250 a.c., 3- and 4-jaw chucks, ⅜" Jacobs drill chuck, 9" and 12" faceplates, handwheel indicator, dividing head, vertical slide, new H.S. tool bits, £55.—Box No. 7173, MODEL ENGINEER Offices.

300 Items. XWD goods for modellers, workshop owners. List 1½d.—ROGERS, 31, Nelson Street, Southport.

Wanted, by model engineer, pair Brown's adjustable reed headphones, will purchase or exchange small tools to value.—Box No. 7164, MODEL ENGINEER Offices.

Bright Mild Steel. Try us for that odd size. S.A.E. for list.—B. J. HARRIS, The Cottage, Corngreaves Hall, Cradley Heath, Staffs.

"Model Engineers" bound volumes, by Percival Marshall, 1930 to 1940. Unbound 1940 to date. Offers? New condition.—R. H. DRUMMOND, Bearwardcote, Etwall, Derby.

J-M "Easyflo" Silver solder, 25 s.w.g., 5', 2s. 3d., 20 s.w.g., 4' 2s. 6d., post 3d. 4" 13 s.w.g. copper tube, 21s. foot.—MODEL SUPPLIES, Sidmouth, Devon.

"Model Engineers," October 14th, 1943 to December, 1952, Nos. 2437, 2251 and 2254 missing. What offers?—WOODFORD, 61, Cromwell Road, Derby.

Amazing Bargain. Plywood, 36 × 13½ × 3/16, 18s. doz., planed timber 36 × 6½ × ¼, 35s. 100 ft., all carr. paid.—D. & M. LORD, 22 & 24, Booth Road, Waterfoot, Rossendale, Lancs.

300 Items. XWD goods for modellers, workshop owners. List 1½d.—ROGERS, 31, Nelson Street, Southport.

Wanted In Good Condition. "Model Engineers," July 5th, 1951 to December 31st, 1953 inclusive, state price to—HEDGE, Box 701, Alberni, British Columbia, Canada.

500 "M.E.'s" 1935-53, 120 "Practical Engineering," 4-jaw chuck, "M.L.7." backplate. First reasonable offer.—W. A. CLIFFORD, 74, New Road, Chilworth, Surrey.

4" 3-Jaw S.C. Chuck, two sets jaws, nearly new, £4. "Adept" No. 1 shaper, £6 10s. "Adept" lathe on stand with motor, tools and three chucks, £10. Wanted, "Model Engineers," volumes 1-3-17-20-33 to 41, 44-45-46-50. Would buy a run of volumes to get these. Bound volumes 8-9-14-15-18-23 for sale.—CLEGG, 15, Rochdale Road, Milnrow, Lancs.

Scophony Baird Twin Track Tape Recorder, microphone, four reels tape, £40 ; any evening or Sunday.—NELHANS, 48, Woodhurst Road, Acton, W.3.

Petter Cold Start Direct Coupled, 110 V, 3 kW generator, perfect condition, £65.—LEWIS Maescilyn, Machynlleth.

Home Constructed "Viewmaster" TV receiver (Wenvoe) less tube and valves, plus cabinet, new, worth £32. No reasonable offer refused.—WALTERS, 17, Brooklyn Terr., Llanhilleth, Mon.

Height Gauge, N.S.F., ex-A.M., 11" oak case, £6. Dial gauge, Ace No. S3, 25s. Large transformer, 200-250 26 V, 36 A, 50s., carriage extra.—S. OLIVER, Laughton's Hill, Stonesfield, Oxford.

For Sale. "Model Engineers," Sept., 1946 to Jan., 1954. In good condition, £5 o.n.o.—T. CHANDLER, 81, Kneller Gardens, Isleworth, Middx.

Sale. 1 pint blowlamp, new, £1. Wanted, "Model Engineers" covering building of "Purley Grange" locomotive.—G. LANGDON, 2, Elysean Cottages, Halberton, nr. Tiverton, Devon.

Bright Mild Steel. Flats, rounds, squares, hexagon. S.A.E. for list.—B. J. HARRIS, The Cottage, Corngreaves Hall, Cradley Heath, Staffs.

CLUB SECRETARIES

Our records of your name and address are due for annual revision. Will you please send us a card giving the name of your club, your name and address and that of your Press Officer or Public Relations Officer.

Write to

Gerald Withers,
Exhibition Manager,
The Model Engineer,
19-20, Noel Street,
London, W.1.

Printed in Great Britain for the Proprietors by ELECTRICAL PRESS LTD., Cordwallis Works, Maidenhead, Berks, and published by PERCIVAL MARSHALL & CO. LTD., 19-20, Noel Street, London, W.1.
Registered for transmission by Magazine Post to Canada including Newfoundland.